PB-213 697

Ski Mountain

a conceptual feasibility study in solid waste management

Metropolitan Sanitary District of Greater Chicago

1972

Distributed By:

NTIS
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

BIBLIOGRAPHIC DATA SHEET

1. Report No.
EPA-SW-46D-72

2.

3. Recipient's Accession No.
PB-213 697

4. Title and Subtitle
Ski Mountain; A Conceptual Feasibility Study in Solid Waste Management

5. Report Date
1972

6.

7. Author(s)
Metropolitan Sanitary District of Greater Chicago

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Metropolitan Sanitary District of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

10. Project/Task/Work Unit No.

11. KXXXXX/Grant No.
G06-EC-00163

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
Office of Solid Waste Management Programs
Washington, D.C. 20460

13. Type of Report & Period Covered
Final Report

14.

15. Supplementary Notes

16. Abstracts

This report is the result of a study initiated to determine the conceptual feasibility of disposing of solid wastes generated within Cook County, Illinois, by constructing a 1,000-foot-high mountain that would eventually be used for a number of recreational purposes. A survey revealed that a mountain of this height could not be built anywhere in the county because of the serious air traffic problems it would pose. The site finally selected is, therefore, 53 miles from Chicago's Loop and straddles the boundary between Will and Grundy Counties; it covers 11 square miles. The factors discussed and evaluated include waste generation rates, site selection procedures, design problems (subsurface conditions, structural stability, decomposition products, cover material requirements, etc.), various forms and combinations of transportation, receiving and processing equipment, costs, financing, and administration.

17. Key Words and Document Analysis. 17a. Descriptors

*Waste disposal (urban areas), *Recreational facilities, Skiing, Lakes, *Sanitary engineering, *Site selection, Construction, Transportation, Financing, Costs, Administration

17b. Identifiers/Open-Ended Terms

*Solid waste disposal, Solid waste generation, Design problems, Cook County (Illinois), Receiving equipment, Processing equipment

17c. COSATI Field/Group 13B

18. Availability Statement
Release to public

19. Security Class (This Report)
UNCLASSIFIED

20. Security Class (This Page)
UNCLASSIFIED

21. No. of Pages
324

22. Price

EPA-SW-46D-72

PB 213 697

SKI MOUNTAIN

A CONCEPTUAL FEASIBILITY STUDY IN SOLID WASTE MANAGEMENT

This report (SW-46d) on work conducted under Federal solid waste management demonstration grant no. G06-EC-00163 was prepared by THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO *and is reproduced as received from the grantee.*

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

U.S. ENVIRONMENTAL PROTECTION AGENCY

1972

An environmental protection publication (SW-46d) in the solid waste management series.

This report has been reviewed by the U.S. Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of commercial products constitute endorsement or recommendation for use by the U.S. Government.

TABLE OF CONTENTS

Page

INTRODUCTION 1

I. SOLID WASTE QUANTITIES I-1
  A. Solid Waste Generation Factors I-1
    1. Population I-1
    2. Employment and Related Land Use I-3
    3. On-site Disposal I-4
  B. Estimated Solid Waste Generation I-4
    1. Residential Solid Waste I-4
    2. Commercial and Industrial Solid Waste I-6
    3. Building Demolition Debris I-7
    4. Rock from Proposed Deep Tunnel Storm Drainage Project I-11
    5. Ash from Power Plants I-12
    6. Dredgings from Waterway I-12
    7. Screenings, Grit and Street Sweepings I-13
    8. Autos I-13
    9. Unit Weights of Solid Wastes I-14
  C. Summary of Projected Solid Waste Quantities I-14
  D. Wastes to Ski Mountain I-17

II. SKI MOUNTAIN SITE II-1
  A. Site Considerations II-1
    1. Civil Jurisdiction II-1
    2. Size and Configuration II-1
    3. Land Use II-2
    4. State Regulations II-2
    5. Geology II-2
    6. Water Pollution Potential II-3
    7. Drainage II-4
    8. Accessibility and Haul Distance II-4
    9. Air Traffic II-5
    10. Land Cost II-6
  B. Site Investigations II-6
    1. Sites in Southwest Cook County II-6
    2. Sites in Northwest Cook County II-7
    3. Sites Outside Cook County II-8

Preceding page blank

TABLE OF CONTENTS (Continued)

Page

C. Site 10 . . . . II-8
  1. Civil Jurisdiction II-8
  2. Size and Configuration II-9
  3. Land Use II-9
  4. State Regulations II-10
  5. Geology II-10
  6. Water Pollution Potential II-11
  7. Drainage II-11
  8. Accessibility II-11
  9. Obstruction to Air Traffic II-12
  10. Land Cost II-12

III. DESIGN PROBLEMS III-1
A. Subsurface Conditions III-1
B. Structural Stability III-1
  1. Foundation III-1
  2. Fill III-2
C. Decomposition Products III-2
  1. Methane III-2
  2. Carbon Dioxide III-3
  3. Leachate III-3
D. Cover Material III-4
E. Drainage and Erosion Control III-6
F. Plant Growth III-6

IV. TRANSPORTATION IV-1
A. Direct Haul via Collection Vehicles IV-2
  1. Compactor Trucks IV-2
  2. Self-dumping Trucks and Semitrailers IV-2
B. Transfer via Highway Vehicles IV-2
  1. Unprocessed Refuse via Semitrailers IV-3
  2. Baled Refuse via Semitrailers IV-4
  3. Shredded and Separated Refuse via Semitrailers . . . IV-4
C. Transfer via Barge IV-5
  1. Rock and Ashes IV-6
  2. Incinerator Residue IV-7
  3. Baled Refuse IV-7
  4. Containerized Refuse IV-7

TABLE OF CONTENTS (Continued)

Page

D. Transfer via Railroad IV-8
E. Pipeline Slurry Transport IV-9
  1. Description of System IV-9
    a. Receiving and processing IV-9
    b. Pipeline and booster pumping IV-10
    c. Separation of solids and wastewater treatment IV-10
  2. Evaluation IV-11
F. Other Transport Systems IV-12
G. Comparison of Transportation Systems IV-13

V. THE SKI MOUNTAIN PLAN V-1
A. Receiving, Processing and Transportation V-1
  1. Barge Transportation V-3
  2. Railroad Transportation V-4
    a. Transfer V-4
    b. Separation V-4
B. Ski Mountain Construction V-8
  1. Site Acquisition and Development V-8
    a. Site acquisition V-8
    b. Subsurface investigation V-9
    c. Utility relocation V-9
    d. Site development V-10
  2. Construction V-11
    a. Rate of filling V-11
    b. Stripping V-11
    c. Filling V-11
    d. Covering V-13
    e. Equipment V-13
    f. Leachate control V-14
  3. Cost V-16
    a. Fixed costs V-16
    b. Variable Costs V-17
    c. Unit costs V-17
C. Returning Organic Material to the Land V-17
  1. Processing V-19
  2. Land Requirement V-19

TABLE OF CONTENTS (Continued)

Page

3. Pollution Control V-20
   a. Air pollution V-20
   b. Water pollution V-21
4. Cost V-22

VI. SKI MOUNTAIN COSTS VI-1
- A. Total Program VI-1
- B. Program Excluding Rock VI-1
- C. Program for 50 Per Cent of Refuse VI-1
- D. Summary VI-5

VII. ADMINISTRATION VII-1

VIII. FINANCING VIII-1
- A. Capital Requirements VIII-1
  1. Capital Expenditures VIII-1
  2. Sources of Capital Funds VIII-1
- B. Annual Revenue Requirements VIII-2
- C. Meeting Revenue Requirements VIII-3
  1. General Tax Funds VIII-3
  2. Direct Charges VIII-3
  3. Combination of General Tax Fund and Direct Charges VIII-3
  4. Recommended Method VIII-4
  5. Charges VIII-4
- D. Financing of Recreation Facilities VIII-5

LIST OF TABLES

Page

Table I-1 Population Projections for Chicago and Suburban Cook County I-2

Table I-2 Projected Commercial and Industrial Land Use In Suburban Cook County I-3

Table I-3 Projected Residential Solid Waste Quantities I-5

Table I-4 Projected Commercial Solid Waste Quantities I-8

Table I-5 Projected Industrial Solid Waste Quantities I-9

Table I-6 Average Unit Weights of Solid Wastes I-15

Table I-7 Summary of Projected Solid Waste Quantities For All of Cook County I-16

Table IV-1 Comparative Costs for Receiving, Processing and Transporting Cook County Materials to the Ski Mountain IV-14

Table V-1 Projected Quantities of Organic and Inorganic Solid Waste for Cook County V-2

Table V-2 Estimated Fixed On-site Costs for Constructing the Ski Mountain V-18

Table VI-1 Summary of Estimated Cost for the Ski Mountain VI-2

Table VI-2 Summary of Estimated Costs for the Ski Mountain Excluding Rock VI-3

Table VI-3 Summary of Estimated Costs for the Ski Mountain Based on Fifty Per Cent of Residential, Commercial and Industrial Refuse and Combustible Demolition Debris VI-4

Table VIII-1 Approximate Charges VIII-5

LIST OF FIGURES

		Following Page
Figure II-1	Northeastern Illinois Metropolitan Area Geologic Environment Potentially Unfavorable for Refuse Disposal	II-2
Figure II-2	Sites Investigated for Solid Waste Mountain and Recreation Area	II-8
Figure II-3	Existing Topography Site 10	II-8
Figure II-4	Proposed Final Topography of Ski Mountain On Site 10	II-10
Figure II-5	Generalized Geological Cross Se[illegible] of Site 10	II-10
Figure IV-1	Generalized Locations for Potential Truck Transfer Stations	IV-4
Figure IV-2	Generalized Locations for Potential Barge Transfer Stations	IV-6
Figure IV-3	Generalized Locations for Potential Rail Transfer Stations	IV-8
Figure V-1	Estimated Unit Costs for Constructing the Ski Mountain	V-18

APPENDICES

TABLE OF CONTENTS

Page

APPENDIX A

Projections by Townships of Population and Residential, Commercial and Industrial Solid Waste for Suburban Cook County

Suburban Cook County Township Index A-1
Projections by Townships A-2

APPENDIX B

State Rules and Regulations

Rules and Regulations for Refuse Disposal Sites and Facilities – April 1966 . . . . B-1
Illinois Sanitary Water Board Rules and Regulations, SWB-8 . . . . B-7

APPENDIX C

Data on Investigated Sites for a Solid Waste Mountain and Recreation Area in Southwest Cook County, Illinois

Size and Configuration C-1
Existing Structures on Sites C-1
Land Value C-2
Accessibility C-2
Relationship to Other Land Uses C-3
Water Pollution Potential C-4
Drainage C-4
Foundations C-4
Obstruction to Air Traffic C-5
Maps and Site Details C-5
Site Rating C-8

APPENDIX D

Correspondence Regarding Conflict Between a 1000-Foot High Solid Waste Mountain in Cook County and Air Traffic

B&V Letter to MSDGC, dated 10-31-69 . . . . D-1
MSDGC Letter to FAA, dated 11-4-69 . . . . D-3
FAA Letter to MSDGC, dated 12-9-69 . . . . D-6
City of Chicago Letter to B&V, dated 1-12-70 . . . . D-9
B&V Letter to MSDGC, dated 2-19-70 . . . . D-10
B&V Letter to MSDGC, dated 3-17-70 . . . . D-13

APPENDICES

TABLE OF CONTENTS – (Continued)

Page

APPENDIX E

Data on Investigated Sites for a Solid Waste Mountain and Recreation Area in Northwest Cook County Without Serious Conflict with Air Traffic

Size and Configuration E-1
Existing Structures on Site E-2
Land Value E-3
Accessibility E-3
Relationship to Other Land Use E-3
Water Pollution Potential E-4
Drainage E-4
Foundations E-5
Obstruction to Air Traffic E-5
Maps and Site Details E-5
Nearest Area Outside Cook County E-10

APPENDIX F

Data on Investigated Sites for a 1000-Foot High Solid Waste Mountain and Recreation Area Near Cook County and Along Illinois Waterway

Size and Configuration F-1
Existing Land Use and Structures on Sites F-2
Land Value F-2
Accessibility F-2
Location F-3
Water Pollution Potential F-3
Drainage F-4
Foundations F-5
Obstruction to Air Traffic F-5
Maps and Site Details F-5

APPENDIX G

Correspondence Regarding Site 10

B&V Letter to MSDGC, dated 7-8-70 . . . . G-1
MSDGC Letter to FAA, dated 7-16-70 . . . . G-2
FAA Letter to MSDGC, dated 8-31-70 . . . . G-4
Illinois State Geological Survey Letter to EPA, dated 8-31-70 . . . . G-6
NGPL Letter to B&V, dated 10-9-70 . . . . G-8

APPENDICES

TABLE OF CONTENTS – (Continued)

Page

APPENDIX G (Continued)

Commonwealth Edison Company Letter to B&V, dated 1-25-71 . . . . G-10
Illinois Bell Telephone Company Letter to B&V, dated 9-30-70 . . . . G-11
Woodward-Clyde & Associates Preliminary Geological Report on Site 10, dated 6-29-70 . . . . G-12
State EPA Letter to B&V, dated 1-11-71 . . . . G-26
B&V Letter to State EPA, dated 1-20-71 . . . . G-27

APPENDIX H

Costing of Processing and Transportation Systems

Direct Haul H-2
  In Compactor Trucks H-2
  In Self-Dumping Trucks and Semitrailers H-4
Transfer via Highway Semitrailer H-6
  Unprocessed Refuse H-6
  Baled Refuse H-8
  Shredded and Separated Refuse H-11
Transfer via Barge H-13
  Rock H-13
  Incinerator Residue H-13
  Baled Refuse H-17
  Containerized Refuse H-17
Pipeline Slurry Transport H-20
Transfer via Railroads H-20
  Residential, Commercial, and Industrial Refuse and Demolition Debris H-21
  Incinerator Residue H-21
  Power Plant Ash H-22
  Rock H-22

APPENDIX I

Reports by Railroad Companies on Feasibility and Cost of Rail Transportation

Report by EJ&E, C&NW, and IC, dated 5-27-71 . . . . . I-1
Report by EJ&E dated 5-27-71 . . . . I-10

INTRODUCTION

The Ski Mountain study was initiated to determine the feasibility of disposing of solid wastes generated within the Cook County area by construction of a 1000 foot high mountain to be used for outdoor recreation.

In line with Sanitary District policy of environmental conservation, certain criteria were considered fundamental. These were:

1. Conservation of natural resources.
2. Protection of the environment against water and air pollution.
3. Provision of a permanent method of refuse disposition.

The Ski Mountain will conserve resources by utilizing discarded materials in the construction of a topographic feature of benefit to the entire region. It will provide needed outdoor facilities for recreation, conservation and education. Facilities will be available for such winter sports as skiing, tobogganing and skating, and summer sports such as camping, hiking and fishing. Wild life habitats will be constructed and preserved and nature trails will allow observation and study of native plants and animals.

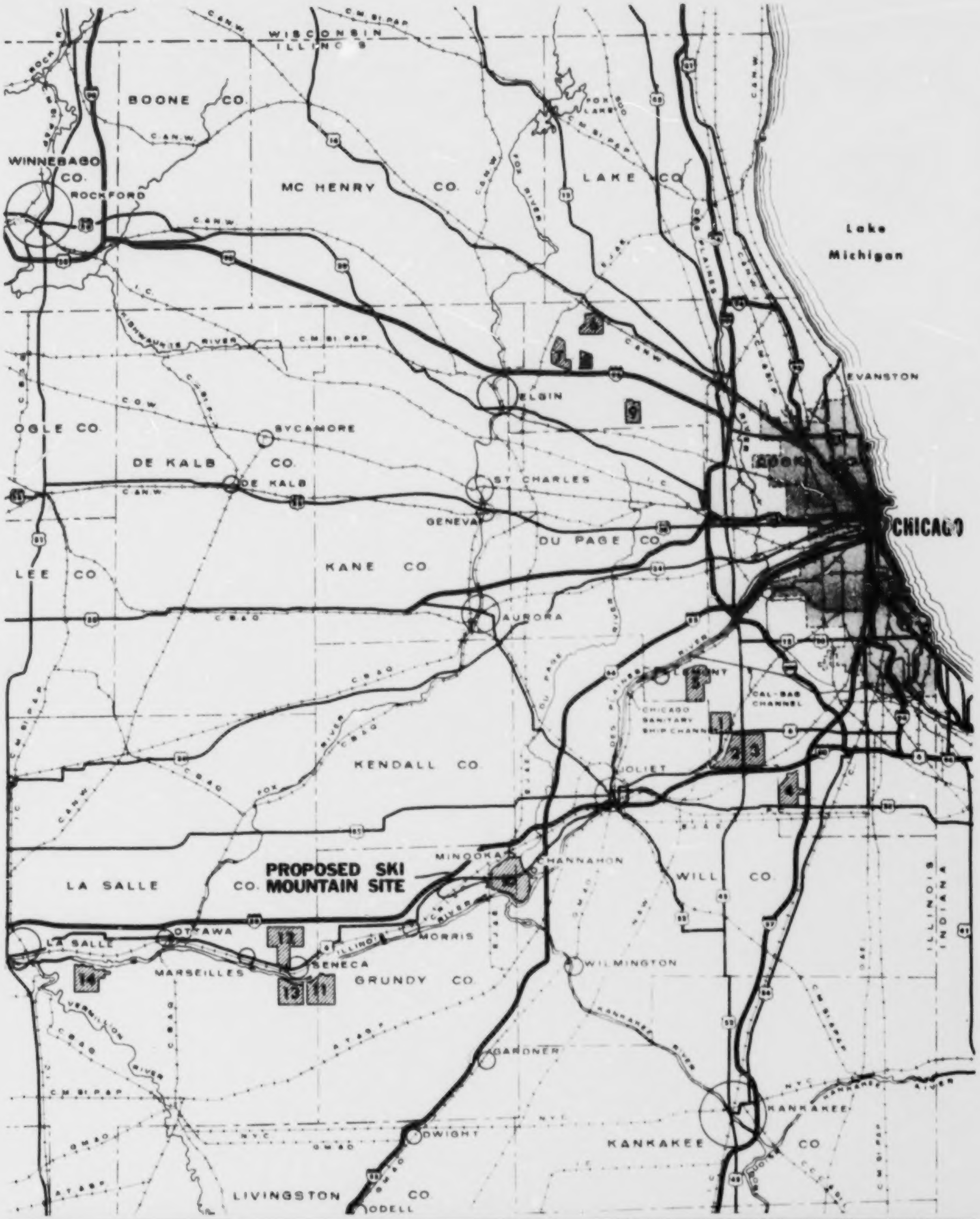
All materials incorporated in the mountain will be in a stable condition. Organic material will be reclaimed or returned to the earth where natural decomposition can occur with benefit to the soil. On-site incineration will be prohibited to avoid pollution of the atmosphere.

By placing only solid fill and previously processed material into the mountain, the construction will become a permanent method of disposal that will eliminate the hazard of future environmental pollution.

An estimate of present and future quantities of materials discarded in Cook County was developed from population and land use projections of the Northeastern Illinois Planning Commission, data furnished by other public agencies and information from private firms. Cook County discards about 7 million tons annually. About 6 million tons consist of residential, commercial and industrial refuse and demolition debris presently collected and disposed of by incineration and landfill. The other one million tons consist of power plant ashes, dredgings from the waterways, street sweepings and similar inert material suitable for solid fill. Excavation for the proposed Chicago area Deep Tunnel storm drainage project will produce about 200 million tons of dolomite rock. Availability and cost of alternatives will determine the quantity available for construction of the Ski Mountain. However, even if all of this material is incorporated, completion of the Ski Mountain will take several generations.

Potential Cook County sites were investigated in detail and it was found that a 1000 foot mountain anywhere in the County would pose serious problems for air traffic. The study area was then broadened and sites outside the County were considered. Fourteen possible sites were thoroughly analyzed to determine their suitability for Ski Mountain. Site 10, finally selected as the basis for the engineering feasibility study and site plan, is only 53 miles from Chicago's Loop. It covers over 11 square miles, and has excellent accessibility due to its location between the Illinois River and I-80 and its proximity to two railroads.

Preceding page blank

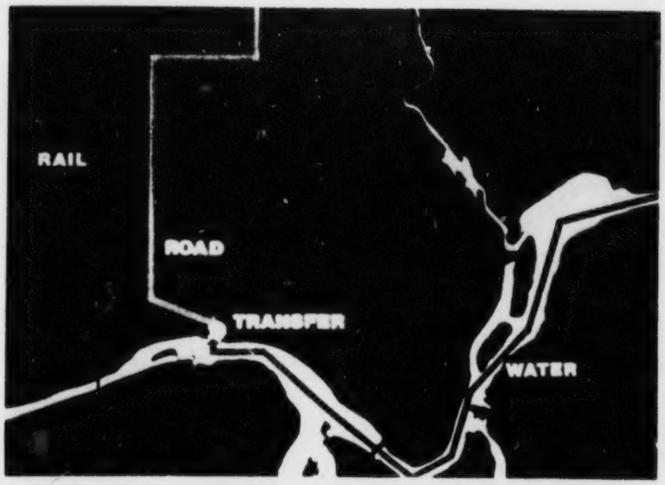

WISCONSIN
ILLINOIS
BOONE CO.
WINNEBAGO CO.
ROCKFORD
MC HENRY CO.
LAKE CO.
Lake Michigan
EVANSTON
ELGIN
OGLE CO.
SYCAMORE
DE KALB CO.
DE KALB
ST CHARLES
GENEVA
DU PAGE CO.
CHICAGO
LEE CO.
KANE CO.
AURORA
LEMONT
CAL-SAG CHANNEL
CHICAGO SANITARY SHIP CHANNEL
KENDALL CO.
JOLIET
MINOOKA
CHANNAHON
PROPOSED SKI MOUNTAIN SITE
LA SALLE CO.
WILL CO.
ILLINOIS
INDIANA
LA SALLE
OTTAWA
MORRIS
SENECA
MARSEILLES
GRUNDY CO.
WILMINGTON
GARDNER
KANKAKEE
KANKAKEE CO.
DWIGHT
LIVINGSTON CO.
ODELL
1
2
3
4
5
6
7
8
9
10
11
12
13
14
NORTH
0 5 miles

SITES INVESTIGATED FOR SOLID WASTE MOUNTAIN AND RECREATION AREA

The development of the Comprehensive Site Plan for the Ski Mountain Project was divided into three general areas for study and consideration:

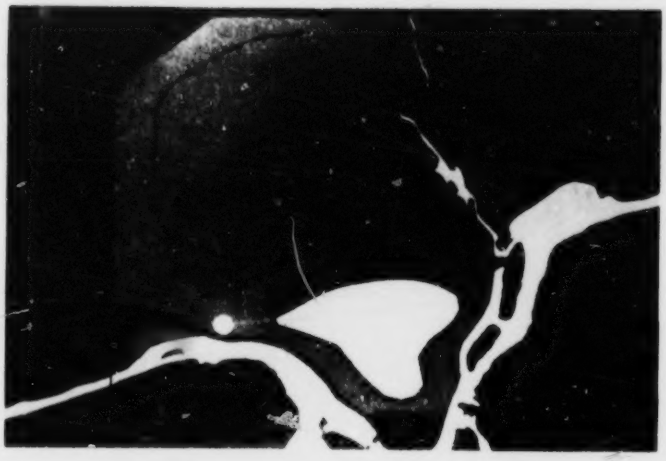
1. The merging of construction techniques and related problems into an integrated planning program.
2. The visual, geological and geographical merging of the mountain into the Illinois landscape.
3. The development of the site into a multiple-use facility.

The program for the merging of the mountain construction into an overall development plan was divided into two basic areas of consideration. First, the transfer of the solid waste from the regional transportation network to the local distribution system; and second, the on-site movement and phased development.

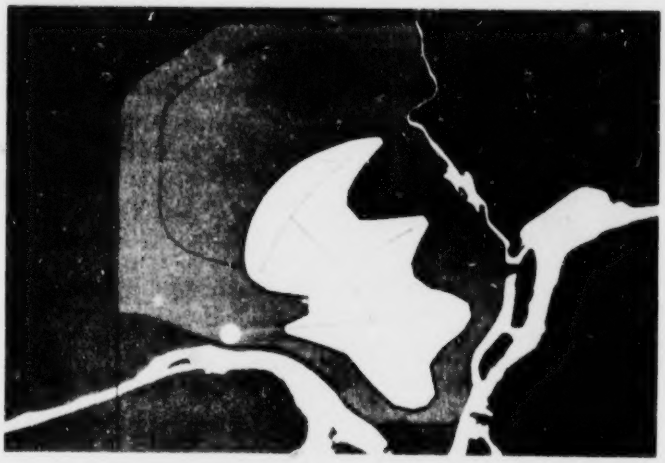


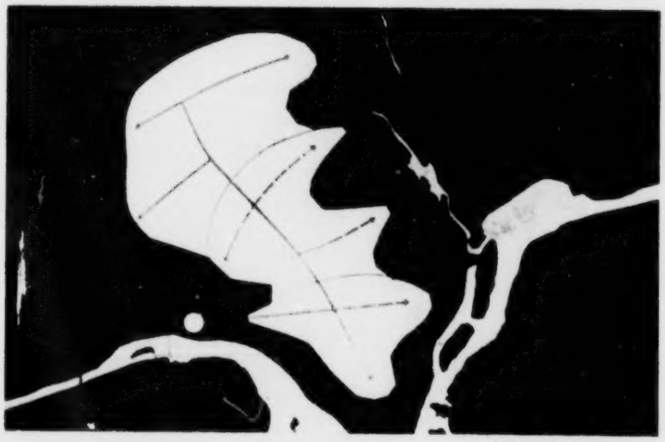
A transfer point was located along the river near the western boundary of the site. This site was selected because of its potential for receiving materials from three modes of transportation: rail movement, road vehicles and barge transport through the inland waterway system, and because of an existing 70 foot bluff which visually isolates the site from the surrounding countryside.

The construction techniques to be used and the patterns of on-site movement of the material were based on the projected final shape of the mountain and its relationship to the overall site plan. In general, the mountain is planned to be constructed from the south towards the north with an ultimate projected increase of 1000 feet over existing elevations.



Throughout the development of the mountain facility, portions of the site will be made available for recreational use. The areas around the mountain, between the edges of the site and the base of the mountain construction will be made immediately available for use as a recreational facility. These peripheral areas will form visual barriers between the on-site work and the surrounding countryside. As the construction of the mountain moves northward and upward, portions of the original construction areas will be landscaped and utilized. By the time the final construction is completed at the northern boundary of the site, major portions of the facility will be in constant use.





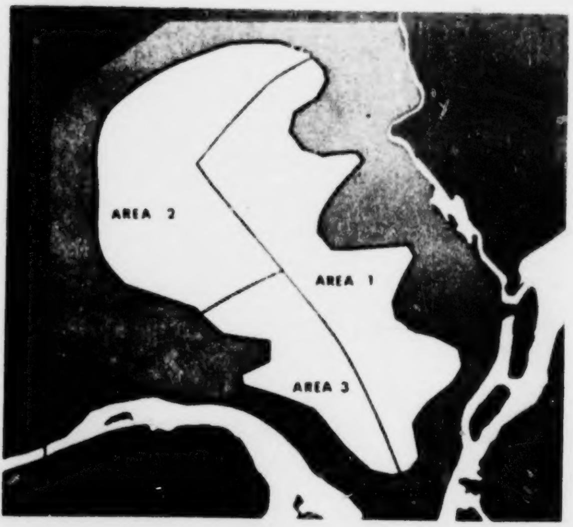
The development of a 1000 foot high mountain that is integrated visually into the flat Illinois topography was the second area of consideration. The final design shape of the mountain resulted from the synthesis of anticipated recreational demands, construction techniques, drainage, landscape design, and topographic and visual considerations. The mountain is designed to be an extension of the existing native landscaping, ravines and gullies along the waterway. The result is a visually pleasing mountain aesthetically integrated into the Illinois topography and designed for maximum multiple use potential.

The development of the Site Plan was divided into three main areas of consideration: recreation, conservation and natural science education.

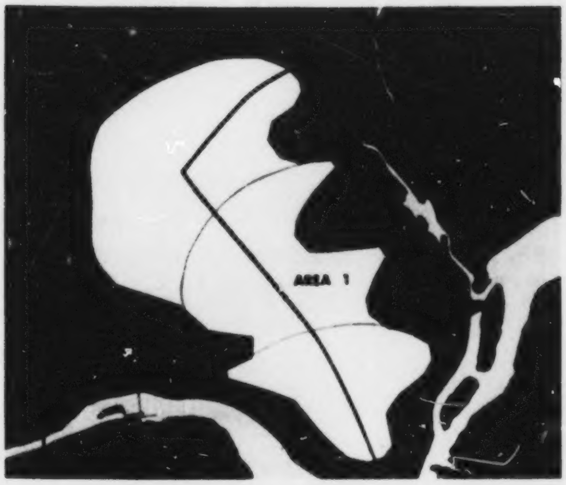
The mountain was designed to provide a recreational facility which will afford people of all age groups and interests an opportunity to participate in a variety of year-round recreational activities in an atmosphere which will insure maximum enjoyment.

The Ski Mountain Plan provides for the conservation of natural resources and the development of new, permanent open space areas. The Mountain will be landscaped to encourage the growth of native grasses, plants and trees, recreating the indigenous Illinois landscape while providing a natural habitat for a wide range of animals and birds. In addition, areas will be designed to provide natural habitats for selected species of animals and birds which are in danger of extinction. Specifically designated sites within densely wooded areas will become sanctuaries for larger animals such as deer, fox, beaver and badgers. The entire site will be designed to act as a living museum of native plants and wildlife.

The Ski Mountain, with its programs of conservation, reconstruction and wildlife preservation, will provide an ideal setting for the construction of a natural science education facility. The planting of native plants and the presence of common and rare species of native wildlife will provide a setting for the education of all age groups, beginning at the grammar school level and progressing through sophisticated graduate research.



The site was divided into three areas for planning of ultimate use. Area No. 1 with its ideal sun orientation, was designed as an active recreational facility. Area No. 2 was designed as a conservation area and natural science education facility, and Area No. 3 was designed as a passive recreational facility. Due to its proximity to the receiving and transfer point, Area No. 3 would be the last area developed for ultimate use. Although activities are primarily located within the specific area designed for them, many functions overlap creating a single, unified facility.



Area No. 1, the year-round active recreational area is visually identifiable by its three bowl-shaped areas, specifically formed and oriented to capture and retain the winter snows. The three bowl-shaped areas, ranging in vertical height from 300 to 500 feet on the south and up to 1000 feet on the north, provide skiing trails with varying degrees of difficulty. In addition to the skiing facility, which provides the site's most dynamic recreational resource, the area is planned to contain numerous additional recreational facilities.

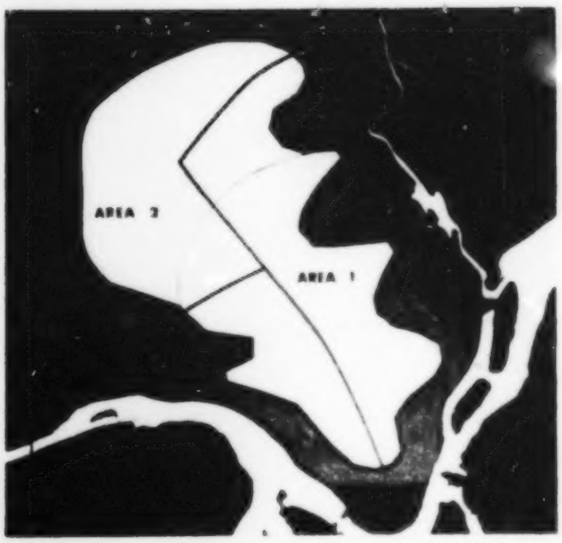
The lakes, which provide the runoff, silt, and pollution control during the construction phases, are to be utilized as a source of water oriented recreation on a year-round basis. During the warm weather, the lakes are to be used for swimming, fishing, boating and sailing. Winter activities include ice fishing, ice skating, speed skating, ice hockey and ice boating. Pollution of the lakes will be prevented by constructing the mountain with essentially stable material and by collecting water which percolates through the fill and treating it to remove or stabilize any pollutants. In addition, a complete interception system would be provided for collecting surface runoff before it enters the lakes. This would include surface ditching, subsurface piping, and retention reservoirs. The interception and control system would prevent surface water from entering directly into the lakes. Upon the detection of a nutrient within the retention reservoir the water would be recycled over cropland for nutrient removal. In addition to the interception system, a 100-foot wide barrier surrounding the lakes would be developed, including very deep-rooted trees and shrubs – its purpose being the interception by the root system of any high-nutrient subsurface water.

The low hills surrounding the lakes are designed for use in the winter time for toboggan runs, and the most gently sloping hills at the base of the mountain become sledding runs.

A complete public convenience facility, including specialty shops, restaurants and lodge facilities, is located between two lakes at the base of the center bowl. This facility could be expanded into a regionally oriented convention and sports center for family enjoyment within a short distance of the Chicago metropolitan area. Across the lake from the lodge and in the open space at the base of the center bowl, a ski jump facility is planned to attract national and international ski jump events.

Park facilities along the existing inland waterway system will be expanded to include a marina, and fishing and sightseeing charter boats. The road adjacent to the waterway will be improved to facilitate pedestrian and automobile sightseeing. The Channahon Lock on the former Illinois and Michigan Canal will be maintained as an historical landmark.

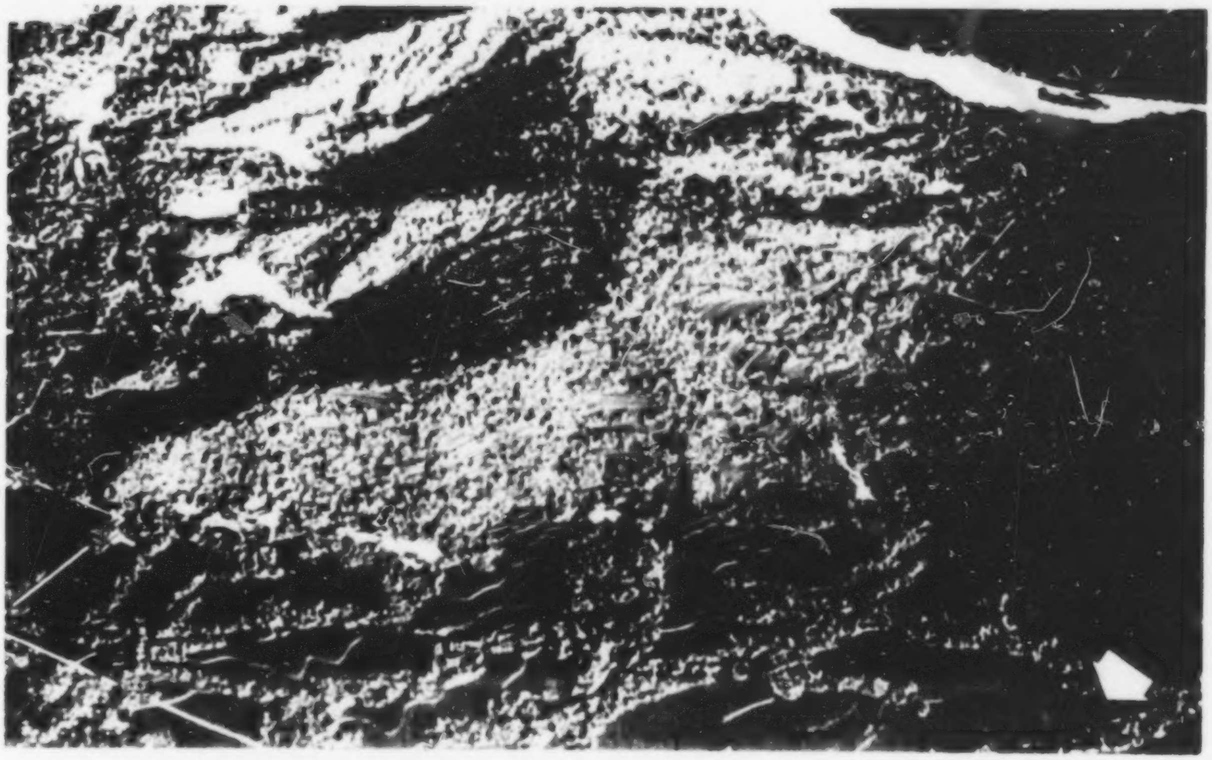
The open fields and meadows around the base of the completed mountain will be developed into family recreation areas which will include picnic facilities, fields for sports such as baseball, football, and soccer, and open spaces for model airplane flying.

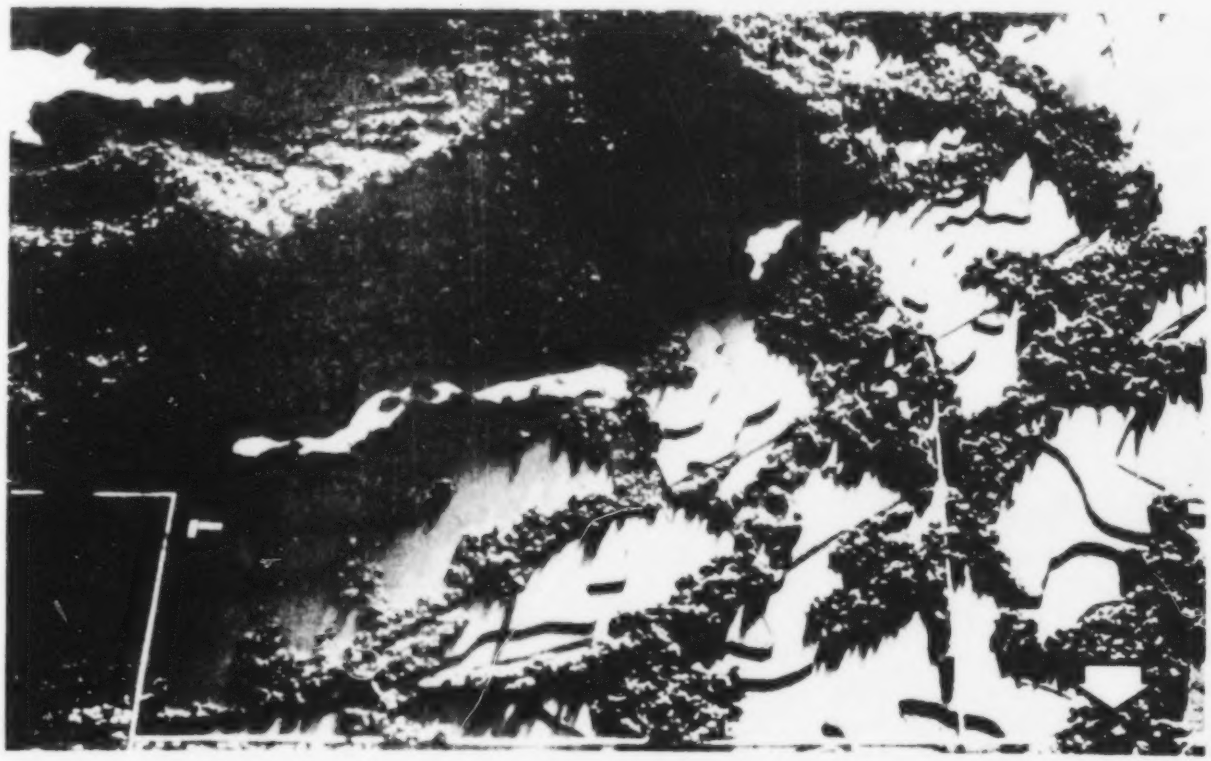


The northern part of the site, designated as Area No. 2, is designed as a large and significant conservation area and natural science education facility. Automobiles will be excluded from this densely covered wilderness area. The reservoirs in this area will be developed into marshes and sloughs for use as natural habitats for a variety of native animals. They also will provide places for birds to rest and feed during their migrations.

The sides of the mountain within this area will be heavily landscaped with native plants, ranging from prairie grasses at the bottom of the slopes through small shrubs and trees and finally into native forests. They will be specifically designed to provide habitats for small and large animals and birds which are native to this region.

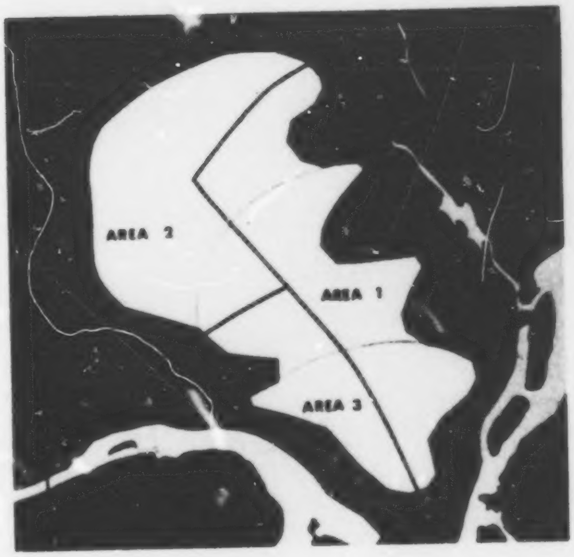
A natural science education facility consisting of a nature center with museum space, classrooms and laboratory facilities will be constructed at the base of the mountain. It will be utilized for orientation lectures and research conducted within the area. It will also be the starting point for a series of hiking trails leading through and around specific areas within the site to amplify the educational programs.





The area on the southwest portion of the mountain site, designated as Area No. 3, will be developed into a passive recreational facility.

This site will provide for family camping, including facilities for camping trailers, cabins and tents. These facilities will be provided in and around the lakes and up on the mountain slopes. All locations will include necessary sanitary facilities. Specific areas will be set aside for institutional use such as the Boy Scout Program. The site will be honeycombed with equestrian, bicycle and snowmobile trails for family use and enjoyment. Trails from these camping facilities, as well as from other points, will lead to an observation point and restaurant complex at the highest point on the mountain.



The result of the three phase design approach is a mountain that visually blends into the Illinois topography and provides a multiple use recreational and educational facility for all the residents of the Chicago metropolitan area.

Feasibility and relative cost of methods that might be used for transport of materials to the Ski Mountain were examined and locations for transportation terminals in Cook County were designated. Several modes of transport will be feasible. Direct haul by collection vehicles will be most economical for materials generated within about 15 miles of the site. Transfer via railroad or large highway semitrailers will be practical means for transporting residential, commercial and industrial refuse from most of the fully developed areas of Cook County. Barging will be the best means for transporting heavy materials such as ash, rock, and demolition debris.

A mountain, 1000 feet in height, will impose extremely high foundation pressures on the underlying formation and within the fill itself, creating the possibility of shear failures and massive slides. Preliminary site investigations indicate that the foundation is likely to be adequate, but little is known concerning the behavior of refuse under heavy loadings. For this reason, refuse will be processed and only stable materials will be placed in the mountain.

The recommended plan envisages the receipt of residential, commercial, and industrial solid wastes at 12 receiving stations within Cook County and processing it for separation into organic and inorganic materials. The stable inorganic materials will be delivered by railroad and placed into the Ski Mountain along with power plant ash and Deep Tunnel rock delivered by barge. The organic materials will be delivered by railroad, spread in thin layers and tilled into the land. A small part of the organics could be placed on the Ski Mountain site; however, up to 40,000 acres of additional land may ultimately be required to receive organics. The humus produced by natural degradation of the organics can be left in place on the land or can be removed and placed on the Ski Mountain. Initial construction will be accomplished with normal earth-moving machinery. As the mountain progresses in height, portable conveyors as used to handle aggregate may be employed.

The initial investment required to construct the transfer stations, purchase the transportation equipment, purchase the land and construction equipment for the Ski Mountain and provide necessary technical services is $275,500,000. Unit cost will be $9.85 per ton for residential, commercial and industrial refuse delivered to the transfer stations. For rock, power plant ash and similar material delivered to barge loading stations, the average unit cost will be $1.21.

There is no existing agency organized to perform the proposed functions and a new agency will be required. The organization should be a state or regional agency authorized by statute. To permit the agency to function effectively, the legislation should provide the power of eminent domain, the ability to enter into long-term contracts and authority to levy taxes and collect service charges.

Refuse disposal is a serious and mounting problem in the Chicago region requiring an imaginative solution on a massive scale. Ski Mountain is just such a solution and this report confirms that the concept is technically feasible; however, broad public support will be necessary to implement this ambitious program which will convert one of the areas's most urgent environmental problems into an impressive recreational legacy for generations to come.

I. SOLID WASTE QUANTITIES

The quantities of various types of solid waste generated in Cook County were estimated from published reports and data furnished by public agencies and private firms involved in the collection and disposal of wastes. Since quantity records are not maintained on most of the solid waste generated, the estimates prepared for this study are necessarily approximations.

Since most solid wastes are highly compressible, quantities cannot be defined by volume alone. Therefore, estimates of compressible waste are expressed in tons, which is the most meaningful measure of such material. Quantities of wastes of relatively high and uniform density such as ash and rock can be measured satisfactorily in cubic yards.

A. SOLID WASTE GENERATION FACTORS

Within a given region, the production of solid waste is determined primarily by the population served and by the commercial, industrial and governmental activity within the community. Employment is a significant indicator of these activities. The quantity of waste actually collected and delivered to central disposal facilities may be significantly less than the quantity generated because of on-site disposal and recycling.

1. **Population.** Projections of residential refuse quantities for this study were based on population estimates by the Northeastern Illinois Planning Commission (NIPC) for 1965, 1975, 1985, and 1995.(1) The NIPC population projections for the City of Chicago and for Suburban Cook County outside the City of Chicago are shown in Table I. The population for intermediate years was projected on a straight line basis between NIPC estimates.

Unpublished NIPC working papers show population forecasts for each square mile in suburban Cook County. This population distribution was used to estimate geographical distribution of residential refuse generation in suburban Cook County.

---

1. Population, employment, and land use forecasts for counties and townships in Northeastern Illinois. NIPC Planning Papers No. 10. Chicago, Northeastern Illinois Planning Commission, Sept. 1968. Table 10, p.40; and subsequent adjustments.

Table I-1

POPULATION PROJECTIONS FOR CHICAGO AND SUBURBAN COOK COUNTY

Year	Chicago	Suburban Cook County	Total Cook County	Year	Chicago	Suburban Cook County	Total Cook County
	(1,000)	(1,000)	(1,000)		(1,000)	(1,000)	(1,000)
1965	3,550.0	1,918.4	5,468.4	1983	3,634.8	2,752.6	6,387.4
1971	3,574.0	2,199.8	5,773.8	1984	3,640.4	2,798.2	6,438.6
1972	3,578.0	2,246.7	5,824.7	1985	3,646.0	2,843.9	6,489.9
1973	3,582.0	2,293.6	5,875.6	1986	3,651.1	2,886.2	6,537.3
1974	3,586.0	2,340.5	5,926.5	1987	3,656.2	2,928.6	6,584.8
1975	3,590.0	2,387.4	5,977.4	1988	3,661.3	2,971.0	6,632.3
1976	3,595.6	2,433.0	6,028.6	1989	3,666.4	3,013.3	6,679.7
1977	3,601.2	2,478.7	6,079.9	1990	3,671.5	3,055.6	6,727.1
1978	3,606.8	2,524.4	6,131.2	1991	3,676.6	3,098.0	6,774.6
1979	3,612.4	2,570.0	6,182.4	1992	3,681.7	3,140.4	6,822.1
1980	3,618.0	2,615.6	6,233.6	1993	3,686.8	3,182.7	6,869.5
1981	3,623.6	2,661.3	6,284.9	1994	3,691.9	3,225.0	6,916.9
1982	3,629.2	2,707.0	6,336.2	1995	3,697.0	3,262.4	6,964.4

2. Employment and Related Land Use. Chicago and suburban Cook County are highly commercialized and industrialized and are the center of extensive governmental activity. The Illinois State Employment Service estimated 1965 employment in Chicago and Suburban Cook County approximately as shown below.[1]

	Employment — 1965		
	Chicago	Suburban Cook County	Total
Manufacturing	516,000	257,000	773,000
Non-manufacturing	1,152,000	357,000	1,509,000
Federal	46,000	8,000*	54,000
Total	1,714,000	622,000	2,336,000

* Allowance by B&V.

Non-manufacturing and federal employees are referred to herein as commercial employees.

As projections of employment by geographical locations were not available, but estimates of industrial and commercial acreage by geographical locations were available for suburban Cook County,[2] projections of commercial and industrial solid waste quantities in suburban Cook County were correlated with projected acreages for the corresponding land uses. Projected totals for commercial and industrial land use in suburban Cook County are shown in Table 2.

Table I-2

PROJECTED COMMERCIAL AND INDUSTRIAL LAND USE IN SUBURBAN COOK COUNTY

Year	Commercial acre	Industrial acre
1965	18,805	10,351
1975	24,854	15,403
1985	32,017	19,004
1995	39,784	22,680

---

1. Illinois State Employment Service. Unpublished data, Jan. 13, 1970.

2. Summary of Cook County 1964 generalized land used in acres (Chicago area transportation study). Unpublished data, 1966: Northeastern Illinois Planning Commission. Projection of manufacturing and non-manufacturing land use in suburban Cook County. Unpublished data, 1969.

3. **On-site Disposal.** Backyard burning of solid waste is not permitted in the City of Chicago. However, on-site incineration is extensively practiced by institutions, industries, commercial firms and apartment buildings. It has been estimated that approximately 25 per cent of the waste generated in the City of Chicago is disposed of by on-site incineration.(1) For this study solid waste incinerated on-site was considered commercial and industrial refuse.

In recognition of the increasing stringency and enforcement of air pollution codes and the difficulties of meeting these codes with small incinerators, this study assumed delivery to central disposal facilities of most of the waste presently burned in on-site incinerators.

Much of the brick, stone, concrete and similar inert solid waste resulting from demolition of buildings and other structures is used to fill basements and to reclaim other land. Some materials, particularly bricks, are salvaged and re-used. These are beneficial re-uses of waste which greatly reduce the quantity of such materials to be hauled to, and disposed of at, central disposal sites. It was assumed for this study that most inert solid fill wastes resulting from demolition work would not be delivered to the proposed solid waste mountain. However, due to difficulty and expense of separation, it is expected that some inert solid fill materials will be received in mixed loads with combustible demolition wastes.

B. ESTIMATED SOLID WASTE GENERATION

1. **Residential Solid Waste.** A 1966 study by the Chicago Department of Air Pollution Control estimated that 1,372,000 tons of residential refuse was collected annually from Chicago's 3,550,000 inhabitants.(2) This is equivalent to 0.386 tons per capita per year, or 2.11 pounds per capita per calendar day (pcd) and is consistent with a median of 2.0 pcd of residential refuse collected from representative American cities as determined by a 1965 survey by the American Public Works Association (APWA).(3)

Table 3 shows the projected future collection of residential refuse in both Chicago and suburban Cook County based on projected population, per capita collection of residential refuse determined by the Department of Air Pollution

---

1. [Solid waste report for the City of Chicago; phase I. Chicago, Department of Air Pollution Control, 1966. p.12.]

2. [Solid waste report for the City of Chicago, p.12.]

3. American Public Works Association. Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.29.

Table I-3

PROJECTED RESIDENTIAL SOLID WASTE QUANTITIES

Year	Per Capita Quantity	City of Chicago			Suburban Cook County			Totals for Cook County		
		Population	Annual	Cumulative	Population	Annual	Cumulative	Population	Annual	Cumulative
	tons/year	1,000	1,000 tons	1,000 tons	1,000	1,000 tons	1,000 tons	1,000	1,000 tons	1,000 tons
1971	0.422	3,574.0	1,508	1,508	2,199.8	928	928	5,773.8	2,436	2,436
1972	0.430	3,578.0	1,538	3,046	2,246.7	966	1,894	5,824.7	2,504	4,940
1973	0.438	3,582.0	1,569	4,615	2,293.6	1,004	2,898	5,875.6	2,574	7,514
1974	0.446	3,586.0	1,599	6,214	2,340.5	1,044	3,942	5,926.5	2,643	10,157
1975	0.454	3,590.0	1,630	7,844	2,387.4	1,084	5,026	5,977.4	2,714	12,871
1976	0.462	3,595.6	1,661	9,505	2,433.0	1,124	6,150	6,028.6	2,785	15,656
1977	0.470	3,601.2	1,693	11,198	2,478.7	1,165	7,315	6,079.9	2,858	18,514
1978	0.478	3,606.8	1,724	12,922	2,524.4	1,207	8,522	6,131.2	2,931	21,445
1979	0.486	3,612.4	1,756	14,678	2,570.0	1,249	9,771	6,182.4	3,005	24,450
1980	0.494	3,618.0	1,787	16,465	2,615.6	1,292	11,063	6,233.6	3,079	27,529
1981	0.502	3,623.6	1,819	18,284	2,661.3	1,336	12,399	6,284.9	3,155	30,684
1982	0.510	3,629.2	1,851	20,135	2,707.0	1,381	13,780	6,336.2	3,232	33,916
1983	0.518	3,634.8	1,883	22,018	2,752.6	1,426	15,206	6,387.4	3,309	37,225
1984	0.526	3,640.4	1,915	23,933	2,798.2	1,472	16,678	6,438.6	3,387	40,612
1985	0.534	3,646.0	1,947	25,880	2,843.9	1,519	18,197	6,489.9	3,466	44,078
1986	0.542	3,651.1	1,979	27,859	2,886.2	1,564	19,761	6,537.3	3,543	47,621
1987	0.550	3,656.2	2,011	29,870	2,928.6	1,611	21,372	6,584.8	3,622	51,243
1988	0.558	3,661.3	2,043	31,913	2,971.0	1,658	23,030	6,632.3	3,701	54,944
1989	0.566	3,666.4	2,075	33,988	3,013.3	1,706	24,736	6,679.7	3,781	58,725
1990	0.574	3,671.5	2,107	36,095	3,055.6	1,754	26,490	6,727.1	3,861	62,586
1991	0.582	3,676.6	2,140	38,235	3,098.0	1,803	28,293	6,774.6	3,943	66,529
1992	0.590	3,681.7	2,172	40,407	3,140.4	1,853	30,146	6,822.1	4,025	70,554
1993	0.598	3,686.8	2,205	42,612	3,182.7	1,903	32,049	6,869.5	4,108	74,662
1994	0.606	3,691.9	2,237	44,849	3,225.0	1,954	34,003	6,916.9	4,191	78,854
1995	0.614	3,697.0	2,270	47,119	3,267.4	2,006	36,009	6,964.4	4,276	83,130

Control, and an allowance of 2 per cent per year increase in the per capita quantity. Geographical distribution of residential refuse by square miles in the City of Chicago is shown in the report by the Air Pollution Control Department. Geographical distribution of residential refuse by square miles in suburban Cook County, based on NIPC population distributions is tabulated in Appendix A.

2. **Commercial and Industrial Solid Waste**. The 1966 Department of Air Pollution Control report estimated annual collection of commercial and industrial solid waste in the City of Chicago approximately, as follows:

	Solid Waste Collected tons/year
Commercial	320,000
Industrial	475,000

The report estimated annual on-site incineration of solid waste in Chicago at approximately 750,000 tons. Since backyard burning of refuse is prohibited in Chicago, it was assumed for this study that most solid waste disposed of on-site was commercial or industrial waste in the same ratio as collected wastes. On this basis, total 1965 generation of commercial and industrial solid waste in Chicago was estimated as follows:

ESTIMATED 1965 CHICAGO COMMERCIAL AND INDUSTRIAL SOLID WASTE

	Tons Per Year	Employees	Tons Per Employee Per Year
Commercial	620,000	1,198,000	0.5
Industrial	924,000	516,000	1.8

The 1965 production of commercial and industrial solid waste in suburban Cook County was estimated at approximately the same per employee rates as estimated for the City of Chicago, and these were converted to annual tons per acre of commercial and industrial land use as follows:

ESTIMATED 1965 SUBURBAN COOK COUNTY COMMERCIAL AND INDUSTRIAL SOLID WASTES

	Employees	Tons Per Year Per Employee	Tons Per Year	Land Use in Acres	Tons Per Year Per Acre
Commercial	365,000	0.5	183,000	18,800	9
Industrial	257,000	1.8	466,000	10,400	45

Table I-4 and Table I-5 show projected future quantities of commercial solid wastes and industrial solid wastes, respectively, for Chicago and suburban Cook County. Quantities for the City of Chicago were projected for an annual increase of 2 per cent*of the estimated 1965 quantities. Quantities for suburban Cook County were calculated by applying to the projected commercial and industrial acreages the estimated 1965 productions per acre increased at the rate of 2 per cent* per year. Projected commercial and industrial refuse quantities by square miles for suburban Cook County, based on NIPC land use projections, are shown in Appendix A.

3. **Building Demolition Debris.** Solid waste resulting from demolition of buildings for urban renewal, highway construction, obsolescence and other reasons is a major element in the solid waste disposal problem in Cook County. Such wastes can be divided into two categories with respect to their potential for disposal, as follows.

> *Solid fill materials.* This category includes brick, stone, concrete, earth and similar solid materials. These wastes are generally used to fill basements of demolished buildings or to reclaim land within the urban area; in addition, some bricks are salvaged for re-use. As these are the most economical and beneficial disposal methods for such waste, it is unlikely that a significant fraction of the solid fill demolition waste would be disposed of in a remote solid waste mountain.

---

* Allowances. Available data do not permit determination of actual rate of change.

Table I-4

PROJECTED COMMERCIAL SOLID WASTE QUANTITIES

	City of Chicago		Suburban Cook County		Total Cook County	
Year	**Annual**	**Cumulative**	**Annual**	**Cumulative**	**Annual**	**Cumulative**
	1,000 tons	**1,000 tons**	**1,000 tons**	**1,000 tons**	**1,000 tons**	**1,000 tons**
1965	619					
1971	693	693	228	228	921	921
1972	706	1,399	238	466	944	1,865
1973	718	2,117	248	714	966	2,831
1974	730	2,847	258	972	988	3,819
1975	743	3,590	268	1,240	1,011	4,830
1976	755	4,345	282	1,522	1,037	5,867
1977	768	5,113	295	1,817	1,063	6,930
1978	780	5,893	308	2,125	1,088	8,018
1979	792	6,685	322	2,447	1,114	9,132
1980	805	7,490	336	2,783	1,141	10,273
1981	817	8,307	349	3,132	1,166	11,439
1982	829	9,136	362	3,494	1,191	12,630
1983	842	9,978	376	3,870	1,218	13,848
1984	854	10,832	390	4,260	1,244	15,092
1985	867	11,699	403	4,663	1,270	16,362
1986	879	12,578	420	5,083	1,299	17,661
1987	891	13,469	437	5,520	1,328	18,989
1988	904	14,373	454	5,974	1,358	20,347
1989	916	15,289	471	6,445	1,387	21,734
1990	928	16,217	488	6,933	1,416	23,150
1991	941	17,158	505	7,438	1,446	24,596
1992	953	18,111	522	7,960	1,475	26,071
1993	966	19,077	539	8,499	1,505	27,576
1994	978	20,055	556	9,055	1,534	29,110
1995	990	21,045	573	9,628	1,563	30,673

Table I-5

PROJECTED INDUSTRIAL SOLID WASTE QUANTITIES

Year	City of Chicago		Suburban Cook County		Total Cook County	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
	1,000 tons	1,000 tons	1,000 tons	1,000 tons	1,000 tons	1,000 tons
1965	924					
1971	1,035	1,035	685	685	1,720	1,720
1972	1,054	2,089	722	1,407	1,776	3,496
1973	1,072	3,161	758	2,165	1,830	5,326
1974	1,090	4,251	795	2,960	1,885	7,211
1975	1,109	5,360	832	3,792	1,941	9,152
1976	1,128	6,488	868	4,660	1,996	11,148
1977	1,146	7,634	905	5,565	2,051	13,199
1978	1,164	8,798	742	6,507	2,106	15,305
1979	1,183	9,981	978	7,485	2,161	17,466
1980	1,202	11,183	1,014	8,499	2,216	19,682
1981	1,220	12,403	1,051	9,550	2,271	21,953
1982	1,238	13,641	1,088	10,638	2,326	24,279
1983	1,257	14,898	1,124	11,762	2,381	26,660
1984	1,276	16,174	1,160	12,922	2,436	29,096
1985	1,294	17,468	1,197	14,119	2,491	31,587
1986	1,312	18,780	1,231	15,350	2,543	34,130
1987	1,331	20,111	1,265	16,615	2,596	36,726
1988	1,350	21,461	1,298	17,913	2,648	39,374
1989	1,368	22,829	1,332	19,245	2,700	42,074
1990	1,386	24,215	1,365	20,610	2,751	44,825
1991	1,405	25,620	1,399	22,009	2,804	47,629
1992	1,424	27,044	1,433	23,442	2,857	50,486
1993	1,442	28,486	1,466	24,908	2,908	53,394
1994	1,460	29,946	1,499	26,407	2,959	56,353
1995	1,479	31,425	1,533	27,940	3,012	59,365

Combustible materials. This category consists principally of lumber, roofing materials and other combustible building materials, but may also include plaster and some bricks and other solid fill waste which cannot be separated economically from combustibles. Combustible demolition waste is difficult to dispose of because under present conditions it cannot be incinerated and is not accepted in many landfills. Currently these wastes are landfilled; but landfills within Cook County which accept combustible demolition material are rapidly approaching depletion.

It was assumed that solid fill materials resulting from building demolition would not be disposed of at the proposed solid waste mountain. Therefore, the quantity of solid fill materials was not estimated.

As no records of the quantity of demolition waste are maintained, the annual quantity of combustible demolition material was estimated from information furnished by demolition contractors and public agencies responsible for removal of existing buildings and structures. The estimated average annual demolition of structures by public agencies and others is shown in the following tabulation.

Agency	Estimated Average Annual Buildings Demolished
Chicago Department of Urban Renewal	700
Chicago Department of Buildings	1,400
Chicago Board of Education	70
Medical Center College	60
Chicago City College	N.E.*
Chicago Housing Authority	N.E.*
Illinois Division of Highways	200
Other public agencies (allowance)	70
Private owners (allowance)	2,500
Total Buildings	5,000

* No estimate, few if any buildings.

Estimates based on all structures demolished by the Chicago Department of Urban Renewal in a one year period indicate that the average structure contains approximately 120 tons of combustible material. On this basis, the estimated annual quantity of combustible demolition material from Cook County was calculated as follows:

5,000 buildings/year x 120 tons/building = 600,000 tons/year

The quantity of combustible building demolition waste is expected to fluctuate appreciably from year to year in response to variations in demolition activities. An average of 600,000 tons per year was used for projection of future quantities.

4. **Rock From Proposed Deep Tunnel Storm Drainage Project.** The Metropolitan Sanitary District of Greater Chicago, in a letter dated February 5, 1970, instructed that this study consider spoil from the proposed Deep Tunnel Storm Drainage Project, as follows:

> Only rock excavated for the underground storage requirements of the project, estimated as follows:
>
> | | |
> |---|---|
> | Northside Area | 11,200 acre-feet |
> | West-Southwest Area | 38,100 acre-feet |
> | Calumet Area | 6,160 acre-feet |
>
> These volumes of rock can be assumed to be delivered to the ground surface at the respective MSDGC wastewater treatment plant in each area.
>
> These volumes do not include excavation for tunnels, primary treatment, air chambers, and other chambers. Rock excavated for such facilities may be omitted for the purpose of this study.

Based on an in situ density of 165 pounds per cubic foot, and a density after excavation of 120 pounds per cubic foot, the weight and volume of rock excavation for the storage requirements of the Deep Tunnel Project are estimated, as follows:

	Cubic Yards	Tons
Northside Area	24,840,000	40,200,000
West-Southwest Area	84,500,000	136,900,000
Calumet Area	13,660,000	22,130,000
Total	124,000,000	199,230,000

It was assumed that this rock would be delivered at a uniform rate over a 10 year period starting in 1975.

5. **Ash from Power Plants.** The Commonwealth Edison Company advised that it annually disposes of about 1,000,000 tons of ashes and other waste by-products of the coal burned in furnaces for electric power generation. Approximately one-half of this material is sold for fill, concrete construction and additives, asphalt filler, and road base ingredient. The remaining 500,000 tons per year might be available for the solid waste mountain.(1)

Most of the power generating stations are located near the waterways and about one-half of the available tonnage of wastes could be moved by barge without a prior truck haul. All of the available wastes could be moved to the disposal site by truck or rail.

6. **Dredgings from Waterway.** The Corps of Engineers, Department of the Army, forecasts approximate annual dredgings from waterways in Cook County as follows: (2)

	Average Annual Accumulation of Sediments	
	Cubic Yards	Tons*
Cal-Sag Channel, Little Calumet River and Calumet River from junction with Sanitary and Ship Canal to Turning Basin No. 5	200,000	160,000
Calumet River	200,000	160,000
Chicago River **	40,000	32,000
Total	440,000	352,000

* Based on in situ density of 60 pounds per cubic foot.
** Dredged every third year.

---

1. Commonwealth Edison Company. Unpublished data, Mar. 10, 1970.

2. U.S. Department of the Army, Corps of Engineers. Unpublished data, Dec. 22, 1969.

Maintenance dredging on the waterways is generally performed under contract. The method of transporting dredged material is not specified and is left to the discretion of the contractor. Transporting to, and disposing of dredged material at, the solid waste mountain may not be economically feasible. Disposal sites along the waterways will undoubtedly be used in preference to the solid waste mountain so long as the former are available.

Usually material from maintenance dredging has a high water content and must be drained prior to hauling by truck or other normal earth moving equipment. Acceptance of dredged material at the solid waste mountain site would probably require the installation of a permanent conveying system for moving the material from barges to dewatering lagoons. After dewatering, the material could be used for covering other refuse in the fill.

7. **Screenings, Grit and Street Sweepings.** Annual cubic yards of screenings and grit from the Sanitary District's wastewater treatment plants and street sweepings were estimated by Bauer(1) as follows:

	Approximate Annual Quantity	
	Cubic Yards	Tons*
Screenings and grit	167,000	167,000
Street sweepings	150,000	150,000
Total	317,000	317,000

* Based on assumed density of 2,000 pounds per cubic yard.

8. **Autos.** A total of 957,212 passenger autos and a total of 1,027,539 vehicles of all types were registered in Cook County in 1969. A recent study by the U.S. Bureau of Mines indicates the number of autos scrapped in the United States each year varies from 6.1 to 7.6 per cent of the number of registered autos.(2) Applying a 7 per cent factor to the Cook County auto registration indicates an annual abandonment and junking rate of about 67,000 for passenger cars and 72,000 for all types of vehicles.

---

1. Bauer Engineering, Inc. Land and recreational development through a rock and solid waste disposal system. The Metropolitan Sanitary District of Greater Chicago, Sept. 1967. p.2.

2. Automobile disposal, a national problem; case studies of the factors that influence the accumulation of automobile scrap. U.S. Bureau of Mines Special Publication No. 1-67. Washington, U.S. Department of the Interior, 1967. p.22.

The Automotive Pounds Section of the Chicago Police Department indicated a total of 87,000 autos were towed to the Department's pounds during 1969. Of this total, about 37,000 had been abandoned. The Cook County Sheriff's Police Department estimates a total of about 5,000 abandoned autos in suburban Cook County. Additional junked cars are in wrecking yards.

Recent advancements in the scrap metal processing industry, principally the development of large shredders, make it feasible to process old autos into high grade, marketable scrap metal. Although collection and disposal of old autos is a significant problem in Chicago and suburban Cook County, the major elements of the problem are transportation, storage and legal processing prior to delivery to scrap metal processors. Scrap metal processors indicate ample capacity in the Chicago area to process all old autos for re-use as high grade scrap metal. Only the nonmetallic parts such as glass, fabric, plastics, and rubber need be considered as solid wastes.

The major effort with regard to old autos should be directed toward getting them to the scrap metal processors. The metallic portions of old autos should not be considered potential material for disposal in the solid waste mountain.

9. **Unit Weights of Solid Wastes.** Unit weights of solid wastes are significant in the study as they influence payload, hauling costs, and landfill space requirements. Unit weights used in the study are shown in Table I-6. These are estimated average values based on observations and published data. Substantial variations from the listed average weights can be expected in individual loads of compressible wastes. Unit weights will also be affected by moisture content.

C. SUMMARY OF PROJECTED SOLID WASTE QUANTITIES

Table I-7 shows the projected annual and cumulative quantities of solid waste from Cook County to 1995. The projections are divided into two general categories of wastes: (1) those containing a high proportion of decomposable organic material, and (2) those consisting of relatively inert material which could be used for constructing relatively stable fill.

Table I-6

AVERAGE UNIT WEIGHTS OF SOLID WASTES

	Residential Commercial Industrial lb/cu yd	Combustible Demolition Debris lb/cu yd	Incinerator Residue lb/cu yd	Separated Inorganic** lb/cu yd	Deep Tunnel Rock lb/cu yd	Power Plant Ashes lb/cu yd	Dredgings From Waterways lb/cu yd	Screenings, Grit and Street Sweepings lb/cu yd
Open truck - loose	200(1)	500(6)	1,000*(7)	700(9)	2,700(11)	2,200(13)	1,600(14)	2,000(16)
Barge or trailer -precompacted by collection vehicle	350(2)	500(6)	1,000*(7)	700(9)	2,700(11)	2,200(13)	1,600(14)	2,000(16)
Collection truck - compacted	500(1)	–	–	–	–	–	–	–
Container - compacted	650(3)	–	–	–	–	–	–	–
Baled	1,600(4)	–	–	–	–	–	–	–
Landfill - unbaled	1,200(5)	1,200(5)	2,500(8)	2,500(10)	3,200(12)	2,600(13)	2,700(15)	2,700(15)
Landfill - baled	1,600(4)	–	–	–	–	–	–	–

* Wet weight

** Inorganics separated from residential, commercial and industrial refuse and demolition debris.

1. American Public Works Association. Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.34.

2. Los Angeles Sanitation Districts, and Orange County, California. Unpublished data.

3. Communication with private contractors.

4. Personal communications. R. H. Sullivan, American Public Works Association, and Patrick Bradley, American Hoist & Derrick Company, [Dec. 1969].

5. City of Los Angeles, Department of Public Works, Bureau of Sanitation. Unpublished data.

6. Personal communications with demolition contractors.

7. Kenahan, C. B., and P. M. Sullivan. Let's not overlook salvage. APWA Reporter, 34(3):5-8, Mar. 1967.

8. Requardt, G. J., and W. M. Harrington, Jr. Utilization of incinerator ash as land fill cover material. In American Public Works Association Yearbook. Chicago, 1962. p.216-225.

9. Assumed to be similar to dry bulk weight of incinerator residue; see reference no. 7.

10. Assumed to be similar to incinerator residue; see reference no. 8.

11. Manual of steel construction. 6th ed. New York, American Institute of Steel Construction, 1967. p.6-13.

12. Estimate for mixed rock and inorganics.

13. Estimate based on correspondence from Commonwealth Edison Company, Chicago, Mar. 10, 1970.

14. [Sediment studies; Potomac River Basin Report. Appendix H. v.7. Baltimore, U.S. Army, Corps of Engineers, 1962. p.52.]

15. Estimated at 100 pcf.

16. Estimated.

Table I-7

SUMMARY OF PROJECTED SOLID WASTE QUANTITIES FOR ALL OF COOK COUNTY

Year	Decomposable Wastes						Solid Fill Wastes						Total Wastes	
	Residential	Commercial	Industrial	Demolition	Subtotal	Cumulative	Rock	Ash	Dredgings	Screenings Sweepings	Subtotal	Cumulative	Annual	Cumulative
	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton	1,000 ton
1971	2,436	921	1,720	600	5,677	5,677	-	500	352	317	1,169	1,169	6,846	6,846
1972	2,504	944	1,776	600	5,824	11,501	-	500	352	338	1,190	2,359	7,014	13,860
1973	2,574	966	1,830	600	5,970	17,471	-	500	352	341	1,193	3,552	7,163	21,023
1974	2,643	988	1,885	600	6,116	23,587	-	500	352	344	1,196	4,748	7,312	28,335
1975	2,714	1,011	1,941	600	6,266	29,853	20,000	500	352	347	21,199	25,947	27,465	55,800
1976	2,785	1,037	1,996	600	6,418	36,271	20,000	500	352	349	21,201	47,148	27,619	83,419
1977	2,858	1,063	2,051	600	6,572	42,843	20,000	500	352	352	21,204	68,352	27,776	111,195
1978	2,931	1,088	2,106	600	6,725	49,568	20,000	500	352	355	21,207	89,559	27,932	139,127
1979	3,005	1,114	2,161	600	6,880	56,448	20,000	500	352	358	21,210	110,769	28,090	167,217
1980	3,079	1,141	2,216	600	7,036	63,484	20,000	500	352	361	21,213	131,982	28,249	195,466
1981	3,155	1,166	2,271	600	7,192	70,676	20,000	500	352	364	21,216	155,198	28,408	223,874
1982	3,232	1,191	2,326	600	7,349	78,025	20,000	500	352	367	21,219	174,417	28,568	252,442
1983	3,309	1,218	2,381	600	7,508	85,533	20,000	500	352	370	21,222	195,639	28,730	281,172
1984	3,387	1,244	2,436	600	7,667	93,200	20,000	500	352	373	21,225	216,864	28,892	310,064
1985	3,466	1,270	2,491	600	7,827	101,027	-	500	352	376	1,228	218,092	9,055	319,119
1986	3,543	1,299	2,543	600	7,985	109,012	-	500	352	379	1,231	219,323	9,216	328,335
1987	3,622	1,328	2,596	600	8,146	117,158	-	500	352	382	1,234	220,557	9,380	337,715
1988	3,701	1,358	2,648	600	8,307	125,465	-	500	352	384	1,236	221,793	9,543	347,258
1989	3,781	1,387	2,700	600	8,468	133,933	-	500	352	387	1,239	223,032	9,707	356,965
1990	3,861	1,416	2,751	600	8,628	142,561	-	500	352	390	1,242	224,274	9,870	366,835
1991	3,943	1,446	2,804	600	8,793	151,354	-	500	352	393	1,245	225,519	10,038	376,873
1992	4,025	1,475	2,857	600	8,957	160,311	-	500	352	395	1,247	226,766	10,204	387,077
1993	4,108	1,505	2,908	600	9,121	169,432	-	500	352	398	1,250	228,016	10,371	397,448
1994	4,191	4,534	2,959	600	9,284	178,716	-	500	352	401	1,253	229,269	10,537	407,985
1995	4,276	1,563	3,012	600	9,451	188,167	-	500	352	404	1,256	230,525	10,707	418,692

D. WASTES TO SKI MOUNTAIN

It is not possible to forecast accurately how much solid waste from Cook County would be disposed of at the proposed mountain because there are disposal alternatives presently available and others which may become available.

The City of Chicago owns and operates three incinerator plants which burn about 660,000 tons of refuse annually. Chicago's new 1,600 ton-per-day incinerator plant, now nearing completion, will increase the City's incineration capacity to approximately 1,000,000 tons per year. Public incinerators in Evanston and Skokie and three private incinerator plants in Cook County add substantially to available incineration capacity. However, the future role of existing incinerator plants is uncertain. Some of the plants will require costly modifications to meet the air pollution code and their owners may adopt other disposal alternatives in lieu of investing in such modifications.

Current incineration costs are reported in the range of $5 to $8 per ton of refuse incinerated. These costs can be expected to escalate due to increasing operating expenses and added capital costs for air pollution control. Comparative costs will probably be a major consideration in decisions regarding continued operation of incinerator plants versus disposal at the mountain.

Most of the solid waste collected in Cook County and not incinerated is currently disposed of in private landfills in the county and adjacent counties. Due to the shorter haul distance from collection areas, these landfills will unquestionably provide lower overall cost for refuse disposal than the proposed mountain. Estimates by knowledgeable refuse contractors of the remaining life of these landfills range from less than 10 years to about 15 years. A representative of the Chicago & Suburban Refuse Disposal Association, whose members reportedly operate 1,000 refuse collection vehicles in the Chicago area, forecast that virtually all landfills now available to its members will be filled within 10 years. The Association sees little possibility of additional private landfill space in the Chicago area. As existing solid waste disposal facilities are phased out, increasing quantities of wastes may become available for construction of the Ski Mountain.

Rock excavated from the proposed Deep Tunnel project may find markets as concrete aggregate, road base material, solid fill for construction projects, or other purposes. Therefore, it is not known what part, if any, of the estimated 200 million tons of Deep Tunnel rock would be disposed of at the proposed mountain.

Although nearby disposal areas for dredgings from the waterways are difficult to obtain, their economic advantages will result in their use, where possible, in lieu of the proposed mountain. Hauling of refuse by rail to sanitary landfills in remote coal strip mines offers the possibility of relatively economical and pollution-free disposal of Cook County solid waste. In addition, it offers the side benefits of removing the disposal operation far from the metropolitan area to sparsely populated regions where it can be used to reclaim virtually useless land for beneficial use. A number of railroads and private disposal contractors are actively promoting such disposal systems.

II. SKI MOUNTAIN SITE

A. SITE CONSIDERATIONS

The following basic factors were considered in investigation and evaluation of sites for the Ski Mountain:

Civil Jurisdiction
Size and Configuration
Land Use
State Regulations
Geology
Water Pollution Potential
Drainage
Accessibility
Air Traffic
Land Cost

1. **Civil Jurisdiction.** Initially, it was considered essential that the site be in Cook County to minimize the cost of delivering solid wastes, to make the ultimate recreation facilities readily accessible to the people living in Chicago and Cook County, and to place the site as directly as possible under the civil jurisdiction of the administrative agency selected or established to operate the disposal and recreational facilities. In addition, in recognition of the widespread opposition of the general public to solid waste disposal facilities, it was thought that Cook County should, if possible, provide sites for disposal of its wastes within its own boundaries. As the study progressed, however, it was found that a 1,000 foot high solid waste mountain in Cook County was not feasible because of serious conflict with air traffic. The Steering Committee then directed that site investigations be extended to areas in Illinois outside Cook County, preferably near the Illinois Waterway to obtain the advantage of low cost transportation by barge. It was recognized that a regional or state agency would probably be required to administer a facility located outside Cook County.

2. **Size and Configuration.** A mountain constructed to a height of 1,000 feet with a 4 to 1 average slope would require a minimum base width of 8,000 feet. Peripheral buffer strips to minimize inconvenience to adjacent properties, and vacant areas for transportation, processing, and other ancillary facilities increase the minimum site dimension to approximately 2 miles, and the minimum site area to 4 to 5 square miles. A larger site would have the advantage of greater design flexibility, greater capacity, more latitude in provision of recreational facilities, and a better opportunity to retain desirable natural features such as drainage areas and tree cover.

3. **Land Use.** Existing man-made structures and facilities such as homes, commercial and industrial buildings, churches, schools, cemeteries, streets, highways, railroads, pipelines, and power lines increase the cost and difficulty of acquiring and developing land for a solid waste disposal facility, as well as the initial adverse impact of such a facility on the local community. Therefore, the search for sites was directed primarily toward agricultural and other relatively undeveloped land.

Investigated sites were evaluated for conformity with NIPC land use plans and preference was given to sites in proposed open space wedges.

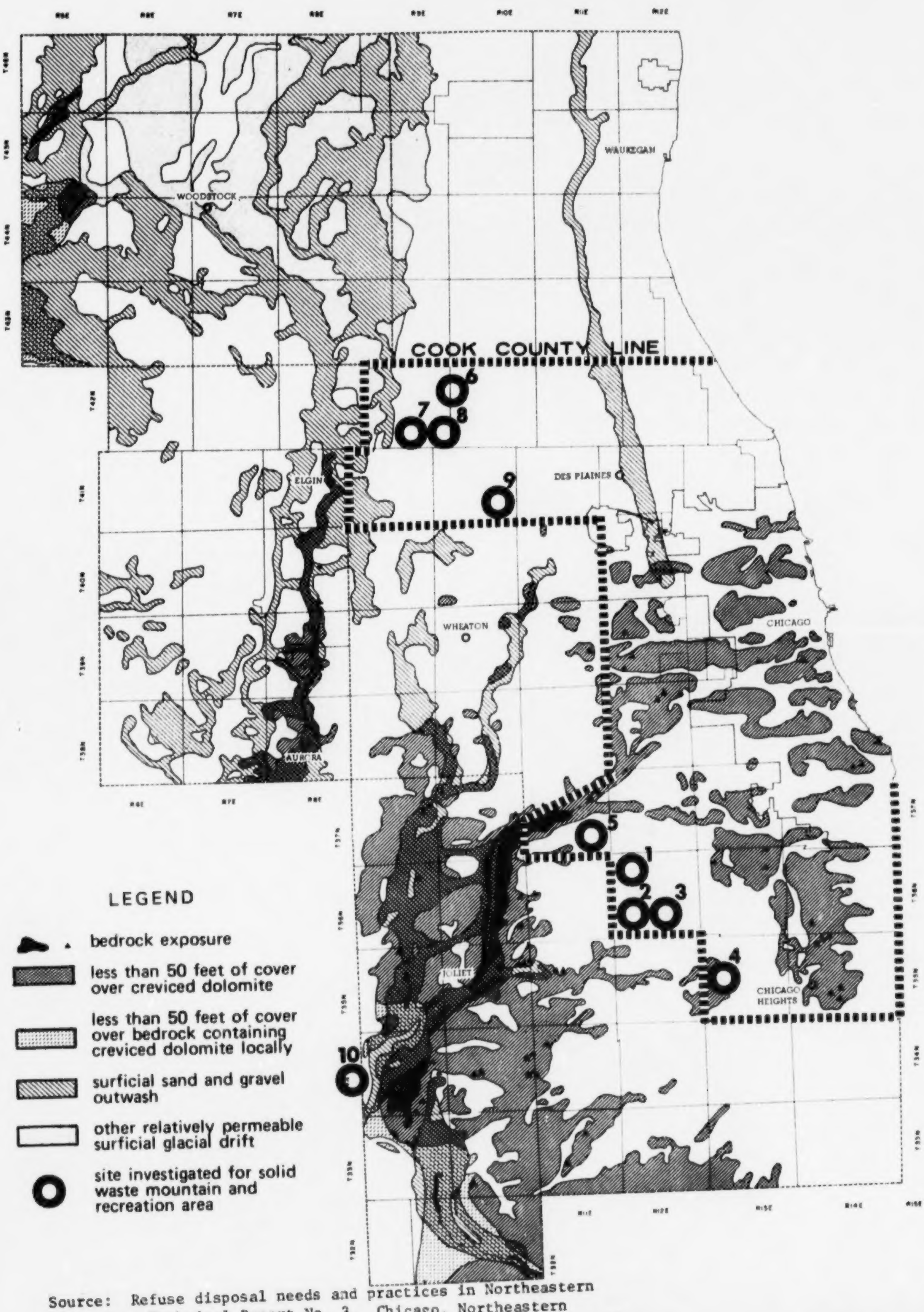
Added consideration was given to sites adjacent to railroads, industrial zones, park lands, waterways, and other land uses which would screen the disposal operation from residential and commercial areas. Sites adjoining land uses which are complementary to the ultimate recreational facilities of the mountain were also favored.

4. **State Regulations.** The State of Illinois Environmental Protection Agency (formerly the Department of Public Health) is responsible for supervision of operation and maintenance of refuse disposal sites and facilities in the State. Refuse disposal sites and facilities must be registered with the Environmental Protection Agency.

Rules and Regulations for Refuse Disposal Sites and Facilities promulgated by the Department of Public Health in 1966 are given in Appendix B.

5. **Geology.** Geology influences the suitability of sites for the Ski Mountain in three important respects. First, a disposal site should be located where ground water is not present or where the subsurface formations minimize the possibility of landfill leachate entering usable aquifers in sufficient quantity and of such quality as to cause pollution. Second, the subsurface formations must have the structural strength to support a fill 1,000 feet in height. Third, the physical characteristics and quantity of unconsolidated formations on the site should provide cover material adequate for the solid waste fill.

Figure II-1 is a map of the Northeastern Illinois Metropolitan Area indicating the generalized geologic environment potentially unfavorable for refuse disposal. Superimposed on the map are the sites within the Metropolitan Area that were investigated for this report. With the exception of Site 4, none of the sites are in areas indicated to be potentially unfavorable.


COOK COUNTY LINE
WAUKEGAN
WOODSTOCK
ELGIN
DES PLAINES
WHEATON
CHICAGO
AURORA
JOLIET
CHICAGO HEIGHTS
1
2
3
4
5
6
7
8
9
10
LEGEND
bedrock exposure
less than 50 feet of cover over creviced dolomite
less than 50 feet of cover over bedrock containing creviced dolomite locally
surficial sand and gravel outwash
other relatively permeable surficial glacial drift
site investigated for solid waste mountain and recreation area
NORTH
0
4
8
12 miles

Source: Refuse disposal needs and practices in Northeastern Illinois. Technical Report No. 3. Chicago, Northeastern Illinois Metropolitan Area Planning Commission, June 1963. p.38.

NORTHEASTERN ILLINOIS METROPOLITAN AREA
GEOLOGIC ENVIRONMENT POTENTIALLY
UNFAVORABLE FOR REFUSE DISPOSAL

FIGURE II-1

6. **Water Pollution Potential.** Rain water and ground water which infiltrate solid waste fill become polluted with bacterial contaminants and soluble organic matter and inorganic salts. If water enters a fill in excess of the quantity required to saturate the solid wastes, the excess water will flow out of the fill as a polluted leachate. Studies by Hughes found that in northeastern Illinois precipitation is adequate to saturate a landfill and produce leachate.(1) Landfill leachate can cause pollution of ground water and surface water if permitted to enter water supply sources without attenuation of the pollutants.

The principal water supply sources which might be polluted by leachate in the area covered by the site survey are the sand and gravel deposits of the glacial drift and river valleys, and the sandstone and limestone formations of the underlying bedrock. Both of these aquifers are used extensively for public and private water supplies and are valuable natural resources which must be protected from pollution.

Fortunately, much of the study area lacks sand and gravel deposits and the bedrock aquifer is protected by a thick cover of relatively impermeable glacial till or lake deposits, or both. These materials consist principally of pebbly clay and silts which do not yield water to wells and which retard the movement of water into and between aquifers. In some areas the top stratum of bedrock is shale, which also retards movement of ground water.

The principal criteria by which sites were evaluated for suitability from the standpoint of preventing water pollution were those stated by Cartwright and Sherman:(2)

> Sanitary landfills should be located in relatively impermeable or slowly permeable material so that movement of refuse leachate will be retarded. Clay, shale, silt, and glacial till are the most common materials for filtering out the biologic organisms of leachate. Sites where sand and gravel occur are generally unsuitable for refuse disposal because of their high permeability.
>
> A minimum of 30 feet of relatively impermeable material is usually required between the base of a landfill and the shallowest

---

1. Hughes, G. M., R. A. Landon, and R. N. Farvolden. Hydrogeology of solid waste disposal sites in northeastern Illinois; an interim report on a solid waste demonstration grant project. Cincinnati, U.S. Department of Health, Education, and Welfare, 1969. p.45.

2. Cartwright, K., and F. B. Sherman. Evaluating sanitary landfill sites in Illinois. Environmental Geology Notes No. 27. Urbana, Illinois State Geological Survey, Aug. 1969. p.7.

aquifer. In general, this means that approximately 50 feet of favorable material is needed for a satisfactory site. A thickness of 50 feet permits trenching to a depth of 20 feet, with 30 feet of material still in place for aquifer protection. If the refuse is to be covered at land surface, without excavation, then 30 feet of relatively impermeable material would be satisfactory.

In areas where the glacial drift or other unconsolidated deposits are less than 30 feet thick, the nature of the underlying rock must be considered in appraising a landfill site. If the bedrock is one of the relatively thick shale formations that occur widely in Illinois, landfill operations might be permissible. If the bedrock is creviced limestone or porous sandstone, both of which serve as aquifers for shallow wells, a sanitary landfill in the thin overburden would not be considered advisable.

7. **Drainage.** The extensive area and steep side slopes of the mountain will result in high volume, rapid runoff of precipitation, which must be accommodated by the drainage courses serving the site. The mountain should not obstruct major water courses and, for that reason, should be located in the upper reaches of a drainage course so that runoff from outside areas will not flow through the site.

8. **Accessibility and Haul Distance.** Transportation is a major factor in the cost of solid waste disposal and a high volume of refuse hauling traffic is a potential cause of inconvenience to the public; therefore, transportation accessibility from the area of production is an important consideration in the selection of disposal sites. To minimize transportation cost, the site should be as close as possible to the area of production and accessible via transport systems capable of moving large volumes without causing significant inconvenience to the public.

Because the optimum method of transportation may vary with the type of waste and the location of the production area, the site should be accessible by several feasible modes of transportation. In the Chicago area the existing transportation systems include highways, railroads, and the Illinois Waterway. Good access via highways is essential because trucking will be the most practical hauling method for some portions of Cook County and for most of the area outside Cook County that might be served.

Access via railroads and the Waterway may be particularly advantageous for transporting the large quantities of deep tunnel rock, power plant ash, incinerator residue, and similar high density nonputrescibles which do not require prompt delivery and disposal for protection of public health and prevention of nuisance.

9. **Air Traffic**. The high volume of air traffic at O'Hare, Midway, and other Chicago area airports, together with the 1,000 foot height of the proposed mountain posed a unique site problem – conflict with air traffic.

Prospective sites were reviewed with the Chicago Area Office of the Federal Aviation Administration (FAA) for possible conflicts with air traffic. The FAA advised that a 1,000 foot high structure at any of the proposed sites in Cook County would seriously conflict with Instrument Flight Rules (IFR) traffic. The conflict with existing traffic would be most serious for sites in southwest Cook County. In addition, a mountain in southwest Cook County could have adverse effects on a future major airport which may be constructed southwest of Chicago.

The FAA further advised that a structure 500 feet or more in height located within 2 miles of a major highway, railroad, river or similar topographic feature used as a visual aid to navigation could have an adverse effect on Visual Flight Rules (VFR) operations. A substantial adverse effect would result from such a structure in western or southwestern Cook County due to the heavy volume of small aircraft traffic on VFR navigation to and from airports in the Chicago Metropolitan area and outlying airports.

The FAA advised that, in general, a location west of Cook County, more than 40 miles from O'Hare Airport and more than 6 miles from local airports would have relatively little adverse effect on aeronautical operations and procedures in the Chicago Metropolitan Area. VFR traffic is lighter over remote areas and the adverse effect of a 1,000-foot high mountain would be much less severe than for the same structure in Cook County.

The FAA reviews of prospective sites were conducted within the FAA organization and were not circularized to other aviation interests. The FAA requests that it be notified when plans for the mountain become definite. They will then initiate a full aeronautical survey, including circularization to aviation interests, and issue an official airspace determination.

10. Land Cost. Land cost will be a major factor in the initial capital requirement of the Ski Mountain project due to the large area required and competing demands for the land.

Recent major land acquisitions in the general vicinity of prospective sites suggest raw land costs in the range of $3,500 to $4,500 per acre for land in southwest Cook County and $700 to $1,600 per acre for farm land comprising a site outside Cook County. Due to the existing estate type development and demand for land for high cost residential development, sites in northwest Cook County are expected to cost in the range of $10,000 to $15,000 per acre.

Within the indicated price range of sites considered, land cost alone should not be a dominant factor in site evaluation since the distance that solid wastes must be transported may have a much greater effect on the overall cost of disposal.

B. SITE INVESTIGATIONS

1. Sites in Southwest Cook County. Investigations were guided by the site considerations discussed previously, and included the following principal steps:

- A thorough survey was made of topographic maps and NIPC land use plans to locate sites appearing to meet the established criteria.
- On-site inspections were made of sites selected from the map survey to determine existing land use, development, and other visible site conditions.
- Generalized geological and ground water conditions of the sites were determined from published reports and conferences with personnel of the Illinois State Geological Survey, Naperville office.
- Information on approximate land values was obtained from public agencies which had recently purchased land in the vicinity of prospective sites.
- Inquiries were made of utility companies regarding the presence and approximate relocation costs of existing pipelines, power lines, cables, and other major utilities on the sites.

- Prospective sites were discussed with representatives of governmental agencies to ascertain the effects of a solid waste mountain and recreation area on existing and proposed land uses of the agency. Agencies contacted included the State Division of Highways, Cook County Forest Preserve District, Northeastern Illinois Planning Commission, Federal Aviation Administration, City of Chicago Aviation Department, and the Cook County Council of Governments.

From the initial investigation, five sites in the southwest part of Cook County, Sites 1 through 5 on Figure II-2, were considered to offer the best possibilities for a 1,000-foot high Ski Mountain and recreation area in Cook County. Results of the initial investigations were reported to the Ski Mountain Steering Committee October 22, 1969. A copy of the report is in Appendix C.

The report stated that, although the sites presented were considered to have the best potential, it was doubtful that any of the sites could be acquired over the objections of the public and the many public and semipublic agencies that would be affected by an operation of the magnitude proposed.

The possibility of a site outside Cook County was discussed by the Steering Committee and rejected because of opposition encountered by MSDGC in its effort to acquire land for sludge disposal outside the County. The committee decided that the site should remain in Cook County and that Site 5, primarily because of its varied transportation possibilities, should be the basis of the study.

In proceeding with detailed investigation of Site 5, a request was made to the FAA for an aeronautical review of the site. Based on its review, the FAA advised that the proposed 1,000-foot mountain at Site 5 or any of the other sites in Southwest Cook County would have a substantial adverse effect upon aeronautical operations and procedures in the Chicago Metropolitan Area. Pertinent correspondence and conference memoranda are in Appendix D.

2. **Sites in Northwest Cook County.** In consideration of the major interference with air traffic in southwest Cook County, the Steering Committee, on March 13, 1970, directed that investigations be made and a report presented on:

- The feasibility of a mountain 500 feet or less in height at Site 5.

- Sites in northwest Cook County that could accommodate a 500 foot ± mountain.
- The nearest locations in Illinois where a 1,000 foot high mountain would not conflict significantly with air traffic.

In compliance with this directive, Sites 5 (Revised) through 9, shown on Figure II-2, were investigated and reported on to the Steering Committee on April 24, 1970. The investigation disclosed that Sites 6 through 9 could accommodate a 500 foot high mountain; Site 5 could accommodate only a 350 foot mountain without interfering with air traffic; and none of the sites could accommodate a 1,000 foot mountain. A copy of the report to the Steering Committee is in Appendix E.

The Steering Committee accepted the report and directed that sites outside Cook County along the Illinois Waterway be investigated.

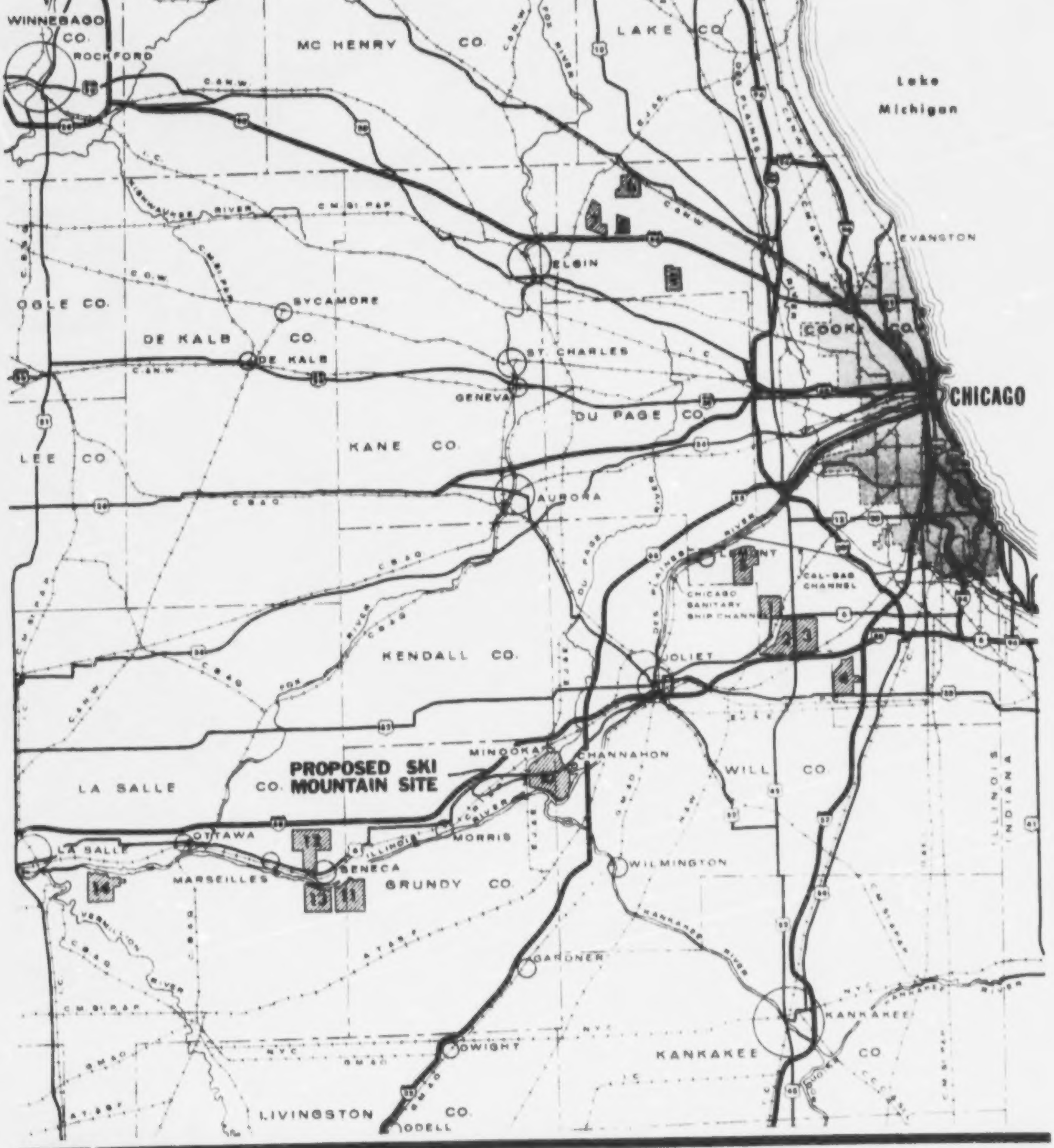
3. **Sites Outside Cook County.** A report on investigations of potential sites outside Cook County along the Illinois Waterway was submitted to the Steering Committee on May 27, 1970. A copy of the report is in Appendix F. Locations of the sites investigated, Sites 10 through 14, are indicated on Figure II-2.

The Steering Committee selected Site 10 primarily because of its transportation possibilities, isolation from residential development, and proximity to Cook County, and directed that the study be completed, based on this site.

C. SITE 10

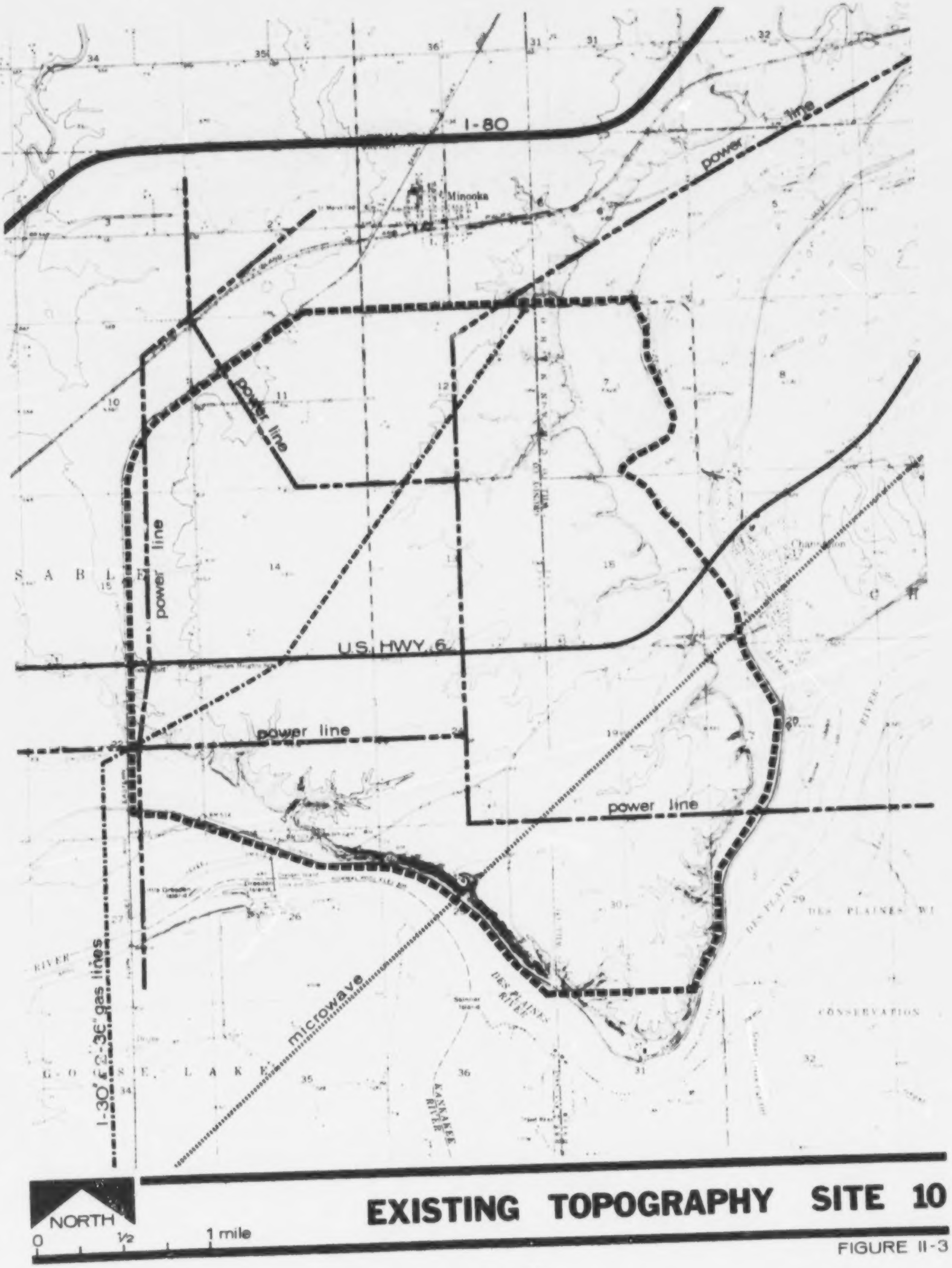
A more detailed evaluation of Site 10 was then made for the Ski Mountain Steering Committee. Figure II-3 is a topographic map of Site 10.

1. **Civil Jurisdiction.** Site 10 straddles the county line between Grundy and Will counties and is outside the civil jurisdiction of Cook County governmental agencies. The MSDGC, which might have been the logical choice as management agency for a metropolitan system located in Cook County, does not have the power of eminent domain outside Cook County. Since power to acquire land will be a requisite, it is doubtful that MSDGC or any other Cook County governmental agency could be the administrative agency for the facility.


WISCONSIN
ILLINOIS
BOONE CO.
WINNEBAGO CO.
ROCKFORD
MC HENRY CO.
LAKE CO.
Lake Michigan
EVANSTON
ELGIN
SYCAMORE
OGLE CO.
DE KALB CO.
DE KALB
ST. CHARLES
GENEVA
DU PAGE CO.
COOK CO.
CHICAGO
LEE CO.
KANE CO.
AURORA
LEMONT
CAL-SAG CHANNEL
CHICAGO SANITARY SHIP CHANNEL
KENDALL CO.
JOLIET
MINOOKA
CHANNAHON
PROPOSED SKI MOUNTAIN SITE
LA SALLE CO.
WILL CO.
ILLINOIS
INDIANA
OTTAWA
LA SALLE
MARSEILLES
SENECA
MORRIS
GRUNDY CO.
WILMINGTON
12
13
11
14
GARDNER
KANKAKEE
KANKAKEE CO.
DWIGHT
LIVINGSTON CO.
ODELL
NORTH
0 5 miles

SITES INVESTIGATED FOR SOLID WASTE MOUNTAIN AND RECREATION AREA

FIGURE II-2



I-80
power line
Minooka
power line
power line
U.S. HWY. 6
power line
power line
microwave
1-30" & 2-36" gas lines
Channahon
DES PLAINES RIVER
KANKAKEE RIVER
S A B L E
G O O S E L A K E
CONSERVATION
DES PLAINES W
RIVER
NORTH
0
½
1 mile

EXISTING TOPOGRAPHY SITE 10

FIGURE II-3

2. **Size and Configuration.** Site 10 extends about 4 miles in the north-south and east-west directions and comprises approximately 7,300 acres. The site is large enough to accommodate a 1,000 foot high mountain and, in addition, provide generous setbacks and protective buffers around the operation with enough space for recreation, nature areas, and other facilities.

The proposed mountain configuration shown on Figure II-4 would accommodate approximately 1.7 million acre-feet of fill.

3. **Land Use.** The bulk of Site 10 is agricultural land; however, a suburban development of approximately 100 homes exists on the eastern edge of the site near U.S. Highway 6. Along the eastern and southern edges, the Illinois and Michigan Canal lies between the site and the north bank of the Des Plaines and Illinois Rivers. Although no longer used, the canal is fairly well preserved and conceivably could be retained and incorporated with the Channahon State Park which occupies the southern tip of the site.

The Du Page, Des Plaines and Illinois Rivers bordering the eastern and southern perimeter of the site provide excellent buffer zones to minimize the impact of the operation on adjacent properties. Much of the land on the opposite side of the Des Plaines and Illinois Rivers is dedicated to conservation use and would complement the ultimate recreational use of the mountain.

The Elgin, Joliet & Eastern Railroad track forms the western boundary of the site and extensive industrial development is occurring immediately west of the railroad. This development and the railroad will serve as a buffer zone west of the site.

With the exception of people living on the site, the communities of Channahon and Minooka are the only major existing developments which might feel a significant impact from the operation. For many years this impact, if any resulted, would be due primarily to increased highway traffic.

U.S. Highway 6, which crosses the site, would ultimately have to be abandoned or relocated. Other roads on the site are of minor significance.

Three gas lines, two electric power transmission lines and a microwave transmission path traverse the site. All of these utilities would require relocation. Additional electric power transmission lines across the site are planned.

4. **State Regulations.** Preliminary data regarding Site 10 and the proposed mountain were submitted to the State Environmental Protection Agency for review. Copies of pertinent correspondence with the State Environmental Agency are in Appendix G.

5. **Geology.** A preliminary geological review and report, based on published data, was made of Site 10 by the firm of Woodward-Clyde & Associates. The Illinois State Geological Survey submitted a letter report on the hydrogeology of Site 10 to the Illinois Environmental Protection Agency, on August 31, 1970. Copies of the report and letter are in Appendix G.

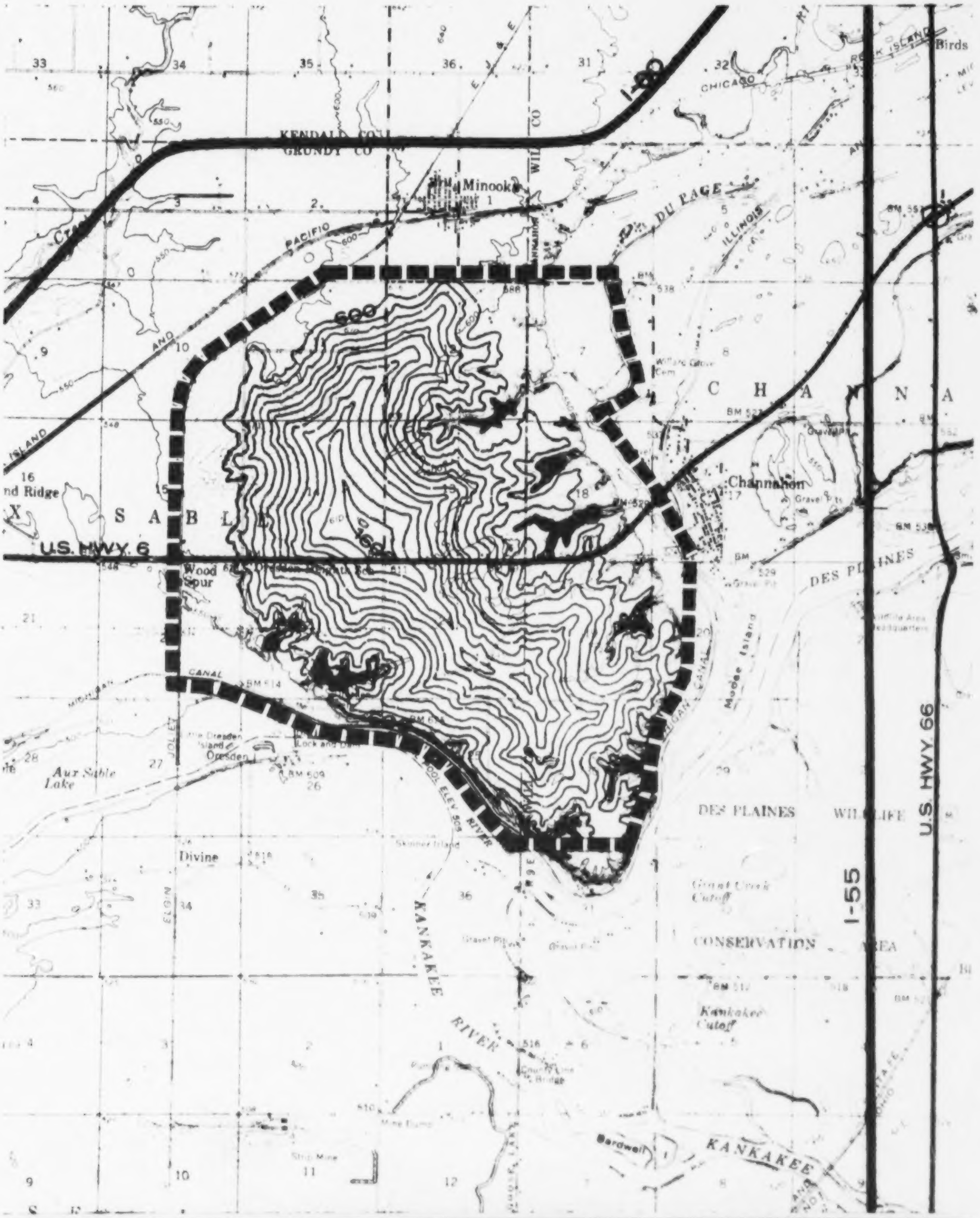
No borings were performed for this study. However, available geologic literature indicates that Site 10 is underlain by bedrock of the Maquoketa formation approximately 80 to 90 feet in thickness. Glacial deposits 50 to 100 feet thick cover most of the bedrock, and these, in turn, are overlain by thin lake deposits. A generalized geological cross section of Site 10 is shown on Figure II-5.

The Maquoketa formation is reported to consist mainly of shale with interbedded limestone or dolomite and, generally, it does not produce ground water. However, in this area the formation is mostly dolomite rather than shale. Water supplies are obtained from wells finished in the Maquoketa formation, the underlying Galena-Platteville dolomite and the St. Peter sandstone. Public water supply wells within the fill area, if any exist, could be replaced with wells outside the fill drilled into the St. Peter sandstone which is the most productive formation.(1)

The glacial deposits are expected to be predominantly a relatively impervious silty clay till; however, significant quantities of pervious granular materials may also be present. Because of its character and precompression, the till likely has relatively high structural strength. Due to the impervious character of the surface deposits, the zone of saturation is expected to be within a few feet of the ground surface during wet periods but significant quantities of free water will be available only where deposits of sand and gravel exist.

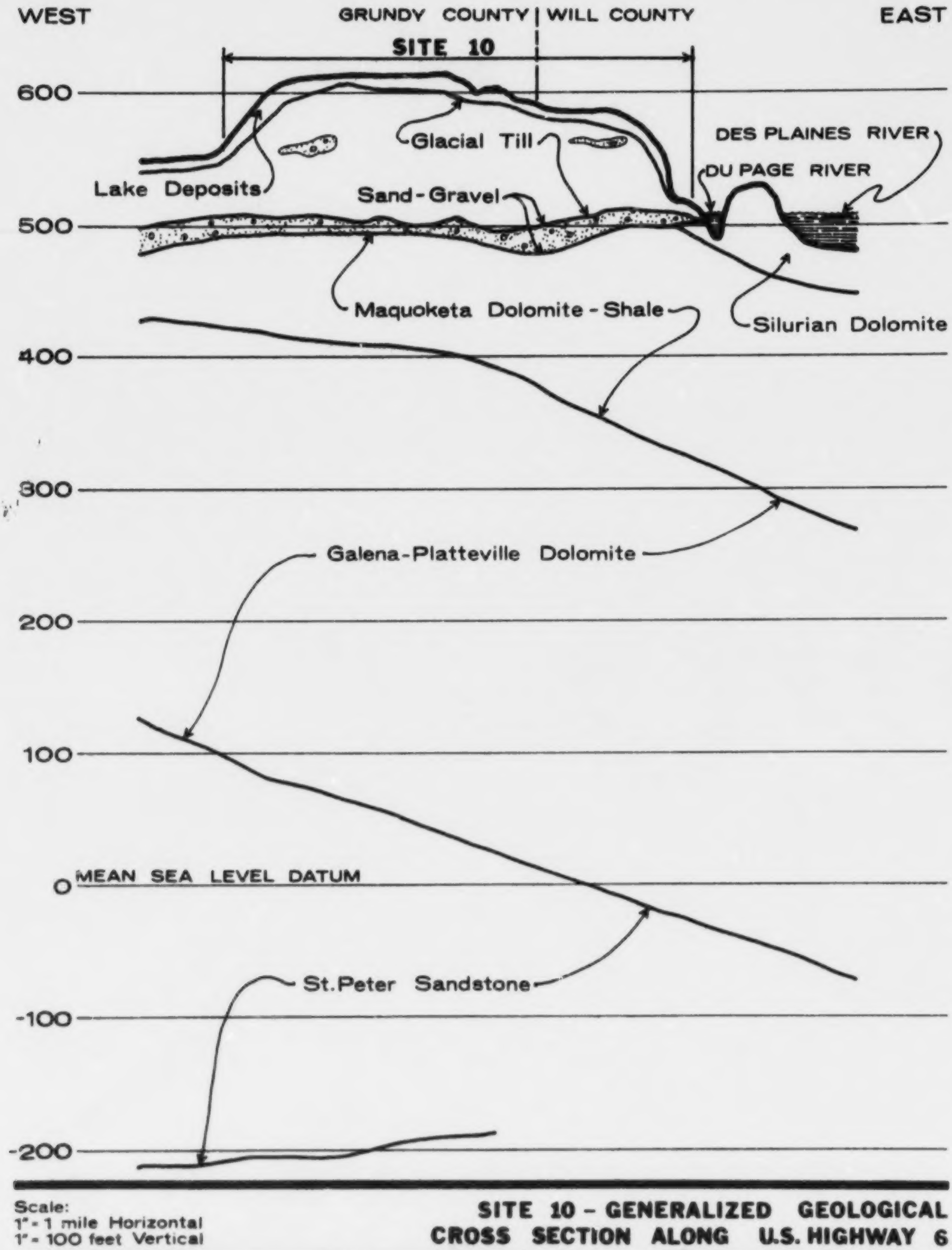
---

(1) Appendix G, p.G-7.


I-80
KENDALL CO
GRUNDY CO
WILL CO
Minooka
PACIFIC
DU PAGE
ILLINOIS
CHICAGO
ROCK ISLAND
Birds
600
C H A N N A
Channahon
Gravel Pits
Willard Grove Cem
16
nd Ridge
X S A B L E
U.S. HWY. 6
Wood Spur
DES PLAINES
Mode Island
CANAL
Aux Sable Lake
Dresden
Skinner Island
Divine
KANKAKEE
RIVER
DES PLAINES WILDLIFE
Grant Creek Cutoff
CONSERVATION AREA
Kankakee Cutoff
Bardwell
KANKAKEE
I-55
U.S. HWY 66
Strip Mine
NORTH
0
1 mile

PROPOSED FINAL TOPOGRAPHY OF SKI MOUNTAIN ON SITE 10

FIGURE II-4


WEST
GRUNDY COUNTY
WILL COUNTY
EAST
SITE 10
600
500
400
300
200
100
0
-100
-200
Glacial Till
Lake Deposits
Sand-Gravel
DES PLAINES RIVER
DU PAGE RIVER
Maquoketa Dolomite-Shale
Silurian Dolomite
Galena-Platteville Dolomite
MEAN SEA LEVEL DATUM
St.Peter Sandstone

Scale:
1" = 1 mile Horizontal
1" = 100 feet Vertical

SITE 10 - GENERALIZED GEOLOGICAL CROSS SECTION ALONG U.S. HIGHWAY 6

FIGURE II-5

The overlying water-laid deposits will have low structural strength and will be more pervious; therefore, they will probably need to be removed so that the mountain can be founded on the glacial till. Material so removed can be used for covering the mountain.

In general, the geology of Site 10 is believed to be favorable for solid waste disposal. However, prior to final design, a thorough subsurface investigation should be made to determine in detail the character, depth and areal extent of bedrock materials and of the various types of unconsolidated materials overlying bedrock, as well as ground water conditions.

6. **Water Pollution Potential.** Because the 50 to 100 feet of relatively impervious glacial till overlying bedrock will greatly retard vertical movement of ground water, there appears little possibility for leachate or gases to cause significant pollution of the bedrock aquifers. Although in some areas the unconsolidated material may be excavated to a depth of 20 to 30 feet to remove unsuitable foundation material and to provide cover, it should be possible to leave a protective blanket at least 30 feet thick over the aquifers. Over most of the site, the protective blanket would be much thicker.

The impervious character of most of the unconsolidated deposits and the long flow path should prevent underground flow of leachate into surface waters in sufficient quantity and strength to cause pollution.

7. **Drainage.** Because Site 10 occupies a drainage divide, surface drainage is outward in all directions and no major water courses would be obstructed.

On the east and south sides, the ground surface slopes rapidly upward from about Elevation 520 along the rivers to about Elevation 610 on the plain. Numerous small, steep drainage courses, perpendicular to the rivers on the east and south sides of the site, will provide excellent surface drainage away from the mountain. Some of these drainage courses can be enlarged and dammed to create small lakes for sediment basins and, possibly, leachate stabilization lagoons. Ultimately, these lakes could be used for recreation.

8. **Accessibility.** Site 10, located approximately 53 highway miles from the Chicago Loop, is readily accessible by highway, railroad and water.

Interstate 80 which passes one mile north of the site and Interstate 55 which passes about 2 miles to the east provide excellent highway access from Cook County.

The Chicago, Rock Island and Pacific mainline tracks from Chicago pass one-half mile north of the site, and the Elgin, Joliet & Eastern tracks form the western boundary of the site. The E.J.&E., a beltline railroad around the periphery of Cook County, connects with the major railroads serving Chicago and Cook County.

The Des Plaines and Illinois Rivers, which are the Illinois Waterway at this location, form the southern boundary and a portion of the eastern boundary of Site 10 and offer potential for transportation by barge, both from Cook County and from communities downstream from Site 10.

9. Obstruction to Air Traffic. The effect on air traffic of a 1,000 foot high mountain at Site 10 was discussed with the Chicago Area Office of the FAA, and they conducted a preliminary aeronautical review. While the adverse effects of a 1,000 foot high mountain at Site 10 would be much less severe than for sites inside Cook County, it will still be an obstruction to some air traffic.

The FAA requests that it be notified when plans become more definite so that a full aeronautical study can be made and an official airspace determination issued. Copies of correspondence with the FAA regarding Site 10 are in Appendix G.

10. Land Cost. Information furnished by MSDGC, based on recent land sales in the general area, indicates an average current value of about $1,400 per acre for land in Site 10.(1) Based on this value and a 10 per cent allowance for legal and other acquisition expenses, the 7,300 acres of Site 10 are estimated to cost approximately $11,000,000. Allowing an additional $3,000,000 for existing dwellings increases the estimated site acquisition cost to $14,000,000.

1. Letter from Frank Dalton MSDGC, Aug. 12, 1970.

III. DESIGN PROBLEMS

A landfill constructed to a height of 1,000 feet will pose most of the design problems of conventional sanitary landfills and, in addition, a number of considerations unique to a fill of this unprecedented height. The following major problems were indentified and solutions for them were formulated.

- Subsurface conditions
- Structural stability
- Decomposition products
- Cover material
- Drainage and erosion control
- Plant growth

A. SUBSURFACE CONDITIONS

Detailed knowledge of subsurface conditions on the site will be required to make definite determinations of its suitability to support the mountain, and to prevent water pollution. Such information will also be necessary for structural design of the fill and for determining the need for remedial work such as replacement of gravel deposits with impervious material to prevent migration of leachate.

Since all evaluation of subsurface conditions has been based on generalized information, it will be necessary to make a thorough subsurface investigation of the site prior to final design of the project. Rules of the State Environmental Protection Agency stipulate that one test hole be drilled for each 5 acres of a proposed site.

B. STRUCTURAL STABILITY

1. **Foundation.** A fill 1,000 feet in height will impose loads of about 50 tons per square foot on the foundations under the higher portions of the fill. Preliminary evaluation of the geology indicates that this load can probably be supported by the 50 to 100 feet of glacial deposits which overlie the bedrock. These deposits are believed to be predominantly glacial till,

precompressed to a relatively high strength. Gradual application of the fill over a period of many years will further consolidate and strengthen this material.

The lake deposits and other water worked deposits which overlie the glacial till have much lower structural strength and will have to be excavated from under the fill so that the mountain can be supported directly on the glacial till.

2. **Fill.** No existing sanitary landfill has approached 1,000 feet in height and the structural characteristics are not adequately defined to indicate whether a fill of that height would be structurally stable. Such a fill containing the proportion of a decomposable matter normally present in sanitary landfills would experience settlement of large magnitude over the years. Shear failures and massive slides within the fill are definite possibilities. Settlement and structural instability would make it difficult or impractical to maintain and operate ski lifts or other structures on the mountain.

Elimination of organic matter from the mountain and filling only with relatively stable wastes such as glass, metals, rocks, ashes, earth, etc., is considered the only practical means of providing reasonable assurance of structural stability of the fill.

C. DECOMPOSITION PRODUCTS

1. **Methane.** A sanitary landfill in northeastern Illinois containing the normal proportion of organic material will decompose and produce large quantities of methane gas. The gas will move out of the fill into the atmosphere and adjacent soil. Methane released to the atmosphere causes no significant problem. The points of gas discharge to the atmosphere can be controlled by installing french drains of rock in the soil around the perimeter of the fill and under the earth cover and providing vents from these drains. Methane discharging from the vents can be burned if desired.

If methane moves through the soil into nearby enclosed spaces under structures, it becomes an explosion hazard. Since there will be few buildings on or near the mountain, the exposure would be slight and can be eliminated by special construction to prevent the entry of gas into spaces where it might accumulate to explosive proportions.

2. **Carbon Dioxide.** Carbon dioxide, produced by decomposition of refuse, is heavier than air and soluble in water. It tends to move outward into the soil around and under a sanitary landfill and to be dissolved by the ground water. Excess concentrations of free carbon dioxide in ground water make the water acidic and cause dissolution of carbonate compounds from soil and rock formations, which increases hardness of the water. Acidity resulting from excess carbon dioxide increases the aggressiveness of a water, thereby accelerating corrosion of such materials as iron, steel, and concrete. A number of cases of ground water impairment by carbon dioxide have been documented by various investigators.(1)

However, studies have shown that an effective barrier to gas movement can be formed with clay or other fine-textured soils when compacted at optimum moisture to 90 per cent of maximum density, and that soil which is maintained in a completely saturated condition has nearly 100 per cent efficiency in stopping both the diffusive and convective flow of gas.(2)

The 30 to 70 feet of water saturated, impervious, silty clay till between the bottom of the solid waste fill and bedrock should provide an effective barrier to prevent the movement of carbon dioxide into any useable ground water under or near the site. The clay immediately below the fill would be reworked and compacted to form a highly impervious membrane.

3. **Leachate.** Precipitation and ground water which enter a landfill will dissolve organic matter and soluble inorganic salts from the refuse and flow out of the fill as a highly polluted leachate capable of contaminating ground and surface water. Elimination of organics from the mountain would greatly reduce organic pollutants in the leachate; but the leachate could still contain inorganics dissolved from water-soluble wastes.

1. Sanitary landfill studies; Appendix A; summary of selected previous investigations. Department of Water Resources Bulletin No. 147-5. State of California, The Resources Agency, July 1969. p.59-60.

2. County of Los Angeles, Department of County Engineer, and Engineering-Science, Inc. Development of construction and use criteria for sanitary landfills; an interim report. Cincinnati, U.S. Department of Health, Education, and Welfare, 1969. p.IV-13, V-4.

A 30 to 70 foot layer of relatively impervious glacial till would be left between the bottom of the fill and bedrock to impede the flow of leachate into any bedrock aquifer. In some locations it will probably be necessary to remove pockets of sand and gravel and replace it with impervious material. All wells under the fill will have to be located and sealed to prevent leachate from entering the aquifers through the wells. Existing wells on the site outside the limits of the fill would be used for water quality monitoring. In addition, an underdrain system would be provided to collect leachate before it could flow out of the fill. Leachate so collected would be given a high degree of biological treatment in stabilization ditches and in lagoons created by damming on-site drainage courses. Treated leachate would be disposed of by irrigation of grass or crops on the solid waste mountain site, and by controlled discharge to the Des Plaines or Illinois River. Treatment of leachate is discussed in more detail in Section V.

D. COVER MATERIAL

A sanitary landfill requires daily cover with earth or other suitable material. In well operated sanitary landfills, cover material occupies from 20 to 30 per cent of the total volume of the fill.

The total volume of the proposed mountain is about 1.7 million acre-feet, and the land area covered by the fill is about 4,500 acres. Assuming that 20 per cent cover material would be used and that this would be excavated from beneath the fill, a total of about 340,000 acre-feet of cover would be required and the excavation would average about 75 feet in depth over the entire area of the mountain. Since the depth of unconsolidated deposits over bedrock ranges from about 50 to 100 feet, there would not be sufficient cover material to allow 30 feet to be left in place to protect the bedrock aquifer.

While the fine grained lake deposits and glacial till would meet most of the functional requirements of sanitary landfill cover, they would be difficult to spread and would become extremely muddy and unstable under traffic during wet weather. Excavation and spreading of cover material would also be quite difficult during extended periods of cold weather when the ground surface might be frozen to a depth of several feet. Under these conditions, satisfactory sanitary landfill operation would be extremely difficult.

Elimination of organic materials from the mountain and filling only with relatively stable materials would reduce cover material requirements to a small fraction of the requirement for a sanitary landfill, and at the same time eliminate many of the operational problems associated with earth cover. The State "Rules and Regulations for Refuse Disposal Sites and Facilities" permit large quantities of noncombustible and nonputrescible material such as rock, concrete, broken pavement, bricks and earth to be placed in a landfill without daily cover. Such materials are required to be leveled and compacted to prevent unsightly appearance and rodent harborage, and to be finally covered as required for a completed sanitary landfill.

The State Environmental Protection Agency advises that in the future the rules will require daily covering for incinerator residue, power plant ash, inorganics separated from combined refuse, and other waste containing any organic matter. Such wastes would be covered in the mountain. However, studies by Requardt and Harrington indicate that after about two years of stabilization, incinerator residue can be used as cover for a sanitary landfill and in several respects is superior to earth cover.(1) Primary advantages cited for incinerator residue over sandy clay include: compactability over a broad range of weather conditions; greater internal strength after compaction; freedom from shrinkage upon drying; and surface rigidity and lack of muddiness during wet weather.

It is anticipated that, after a period of aging in the fill to permit stabilization of organic matter, incinerator residue and shredded inorganic materials such as glass, cans, ceramics, etc., could be excavated and used as cover for newly deposited wastes.

The reduced cover requirement for a fill without organics would reduce the excavation requirement to a depth of 10 to 20 feet under the entire mountain. The problems of excavating wet material and dewatering the excavation would be reduced and the problems of a muddy and unstable operating surface for mobile equipment would be virtually eliminated. The surface of the fill would be stable under all weather conditions and if properly compacted, the fill would be subject only to slight settlement.

---

1. Requardt, G. J., and W. M. Harrington, Jr. Utilization of incinerator ash, p.216.

E. DRAINAGE AND EROSION CONTROL

Much of the drainage of surface water from the mountain must be by overland flow. Severe erosion will occur on the long side slopes unless provisions are made to retard the rate of runoff and prevent concentrations of overland flow that would cause scouring velocities.

Establishment of a dense ground cover of grass and other plant growth on the side slopes will be essential for control of runoff and erosion. Plants will provide a physical barrier to erosion and will reduce the rate of runoff by trapping water so that it will drain off slowly, giving it a greater opportunity to soak into the ground where it will be used to sustain plant growth.

To prevent erosive concentrations of overland flow, the runoff from roads, parking areas and similar impervious surfaces on the mountain should be spread thinly over a large area. If overland flow is greater than can be controlled by plant growth and uniform distribution, it should be intercepted by terraces and conveyed at low velocity to drains which will carry it to the toe of the mountain. Adequate drainage facilities should be provided to convey runoff from there to the Des Plaines or Illinois Rivers. If the runoff carries an objectionable quantity of sediment, it should be passed through retention reservoirs where sediments would be removed before the water is discharged to the rivers. The retention reservoirs would be monitored for water quality. If unacceptable levels of nutrients are detected, the water would be recycled onto farm land by irrigation.

Runoff from the large working surface on top of the fill during construction should not be permitted to flow down the finished side slopes. This water, which will carry an appreciable sediment load, should be drained to a pond at the base of the fill. After sedimentation, it would be discharged at a controlled rate to the rivers or, if necessary, recycled onto farm land or treated and disposed of as outlined for leachate.

F. PLANT GROWTH

In addition to its benefits for erosion control, plant growth on the solid waste mountain will be vital to development for park and recreation use.

Meager information regarding plant culture on completed sanitary landfills indicates little difficulty with grass and shallow rooted shrubs planted on final cover at least two feet thick. It is reported, however, that deeper rooted shrubs and trees have been killed by the heat resulting from decomposition.

Elimination of organic materials from the solid waste mountain would greatly reduce the possibility of heat damage to plant life. A final cover at least five feet thick would also improve growth conditions for plants of medium root depth.

The high proportion of fine grained material in the lake deposits and glacial till available for cover may make these materials too tight for optimum plant growth. Better growth characteristics can be given to these materials by mixing humus with the top 24 inches of the final cover.

Areas of heavy vegetation around the base of the mountain would be utilized for nutrient removal from surface runoff and effluent from the leachate treatment facilities. If required, nutrient-bearing water would be recycled onto the land by irrigation where the nutrients would be utilized by the vegetation.

IV. TRANSPORTATION

Transporting solid wastes from the point of origin to the point of disposal is a significant factor in the overall cost of refuse service. In many situations, the cost of transportation exceeds the cost of disposal. Solid waste hauling costs are affected by many factors and under different conditions may range as widely as from $0.02 to $1.00 per ton-mile, based on one-way distance and including the cost of the return trip.

Labor is a major element of cost in most transportation methods. In systems involving smaller vehicles, it may represent 50 to 90 per cent of the total cost. The transfer concept of transportation has been developed to obtain the cost advantages of low manpower systems. Under this concept, transfer stations are provided close to the area of generation. Refuse collection vehicles, usually staffed by 2- to 4-man crews, deliver to a transfer station rather than traveling a long distance to the disposal site. The wastes are transported from the transfer station to the remote disposal facility in large capacity vehicles at a low ratio of manpower per ton-mile. Most transfer systems utilize tractors and semitrailers traveling over the highways. Railroads, barges and possibly other transportation systems such as pipelines, under some conditions, may also be feasible for transport of solid wastes.

Investigations were made of the following methods for transport of solid wastes to the proposed Ski Mountain site:

Direct haul in:
    Compactor type collection trucks
    Dump trucks
    Semitrailers

Transfer via:
    Highway vehicles
    Railroads
    Barges
    Pipelines
    Conveyors

Bases for estimating of the cost of transporting solid wastes by these methods are given in Appendix H.

A. DIRECT HAUL VIA COLLECTION VEHICLES

1. **Compactor Trucks.** Hauling directly to the disposal site in the collection vehicle is the prevalent practice in Cook County and it will probably continue to be the most economical means for delivering most of the refuse generated within a 10 to 15 mile radius of the proposed mountain. However, because of relatively low pay load capacity and high capital cost for compaction equipment which is not needed for the hauling function, collection vehicles generally are not economical for long distance hauling.

2. **Self-dumping Trucks and Semitrailers.** Open, self-dumping trucks and tractor-semitrailers are used extensively for hauling bulky materials such as ashes, demolition debris, rock, and incinerator residue.

B. TRANSFER VIA HIGHWAY VEHICLES

Where the disposal facility is sufficiently remote from the area of generation, it may be economical to transfer refuse, near its point of origin, from the collection vehicles to considerably larger vehicles for transportation to the disposal site. The advantage of transfer haul in high capacity vehicles is readily apparent from a comparison of the unit cost of hauling in a 20 cubic yard collection truck with a normal pay load of 5 tons and in a 60 cubic yard vehicle with a nominal pay load of 15 tons. For a 3-man collection crew, a driver only for the larger vehicle, and an average speed of 30 miles per hour, the comparative costs are:(1)

20 cubic yard vehicle	$0.35/ton-mile
60 cubic yard vehicle	$0.08/ton-mile

While the unit haul cost is substantially lower in large capacity vehicles used for transfer operations, the capital and operating costs of transfer stations are substantial and must be charged to the transfer operation. Transfer is not economically justified unless the cost of direct haul in collection vehicles is greater than the total cost of transfer, which includes:

---

(1) See Appendix H for cost derivations.

Cost of haul in collection vehicle to transfer station
Cost of transfer station
Cost of haul in transfer vehicle to disposal site

To be of maximum benefit, transfer stations should be centrally located in the area of refuse production to minimize costly transportation in low capacity collection vehicles. Stations should have good highway access and be located in industrial areas which can accommodate heavy truck traffic. Figure IV-1 shows potential general area locations of truck transfer stations to serve Cook County. Transfer stations should be completely enclosed, architecturally pleasing, and designed to minimize nuisance to surrounding areas.

A transfer system should have capacity to handle the peak quantity of refuse delivered by the collectors it serves. Experience suggests that daily quantities of 130 per cent of average daily quantities can be expected. Stations serving primarily residential collectors should be able to receive most of the daily refuse in the two 2-hour peak delivery periods occurring just before noon and just before the end of the day shift.

1. **Unprocessed Refuse via Semitrailers.** The concept of transferring residential, commercial and industrial refuse via van-type semitrailers having a capacity of about 95 cubic yards and an average pay load of 16 tons was considered.

Transfer stations would have a nominal capacity of 1,000 tons and a peak capacity of 1,300 tons per day to accommodate seasonal variation in refuse production. Nominal annual capacity of a station would be 312,000 tons. A station would receive most deliveries during the day shift but would be open 24 hours per day Monday through Friday and 16 hours on Saturday. Loads would be dumped from collection vehicles directly into transfer trailers. Facilities would be provided for loading six semitrailers simultaneously.

Three tractors would be provided at the station for positioning transfer trailers and three hydraulic cranes would level and compact the loads in the trailers.

2. **Baled Refuse via Semitrailers.** A new, experimental concept of receiving and baling refuse at transfer stations and hauling the bales on flatbed semitrailers was also considered.

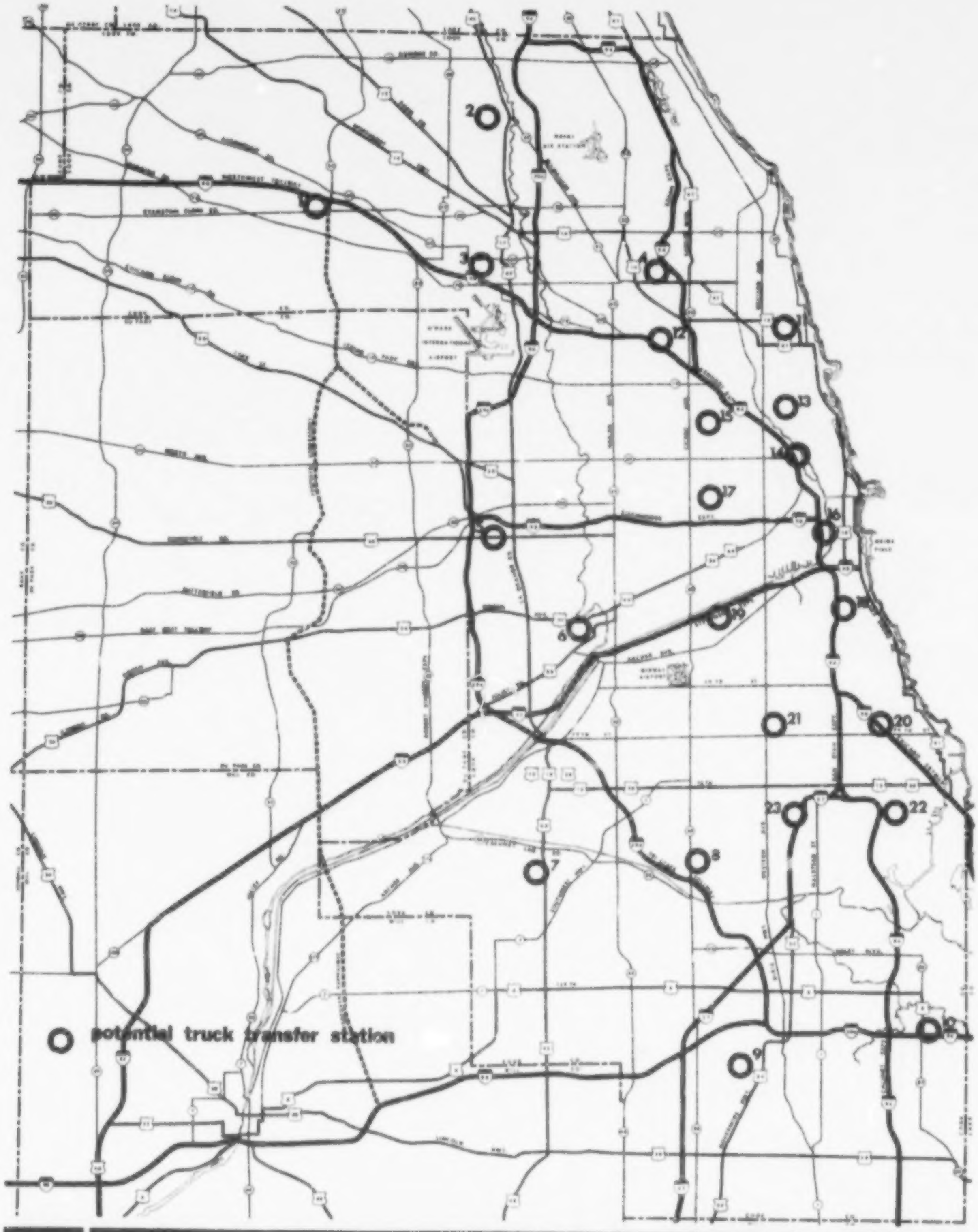
Transfer stations would have 1,000 tons per day nominal capacity with two baling presses operating two 8-hour shifts, 6 days per week. A third press would be included for standby. Refuse in excess of average daily quantities would be handled by working a third shift or by operating the standby press.

Most of the refuse would be received during the day shift but the station would be open to receive deliveries 24 hours per day on week days and 16 hours on Saturday. Collection vehicles would dump into a storage pit from which the material would be conveyed by crane to the presses.

3. **Shredded and Separated Refuse via Semitrailers.** Preliminary investigations were made of the concept of shredding and separating refuse into organic materials and inorganic materials at transfer stations, and transporting the separated materials by van-type semitrailers. Semitrailer volumes and pay loads would be approximately 95 cubic yards and 16 tons for organic materials, and 60 cubic yard and 20 tons for inorganic materials.

The transfer-processing stations would have a nominal capacity of 1,000 tons and a peak capacity of 1,300 tons per day to accommodate seasonal variations in refuse production.

Most of the refuse would be received during the day shift but all portions of the station would be operated 24 hours on week days and 16 hours on Saturday. Collection vehicles would dump into a storage pit from which the material would be conveyed by crane to the processing equipment.


O potential truck transfer station
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
O'HARE INTERNATIONAL AIRPORT
MIDWAY AIRPORT

NORTH

0 1 2 3miles

GENERALIZED LOCATIONS FOR POTENTIAL TRUCK TRANSFER STATIONS

FIGURE IV-1

C. TRANSFER VIA BARGE

Barging on the Illinois Waterway offers the possibility of low cost transportation for high density materials. The Waterway provides direct access to the proposed Ski Mountain site from the City of Chicago, Evanston and Niles Townships, and the portion of suburban Cook County lying generally between 183rd Street on the south and the Eisenhower Freeway on the north. The remainder of suburban Cook County is too far from the Waterway to be served economically by barge.

Transfer stations would be required along the Waterway where collection vehicles could discharge materials for loading onto barges. They would incorporate off-channel dock facilities for storing and loading barges. Figure IV-2 indicates potential general area locations for barge transfer stations.

Rock, ashes, incinerator residue and similar inert materials could be discharged directly from trucks or other conveyances into barges. Processing operations such as baling, containerization, shredding, and separation, if used, could be performed at the transfer stations prior to loading.

Standard hopper barges on the waterway are 195 feet by 35 feet overall and have a maximum load capacity of about 1,400 tons. However, maximum pay loads are possible only with high density materials such as rock and ashes. Standard barges can be used on all of the Waterway south of Addison Street. Smaller barges having a load capacity of 600 tons must be used on the Waterway north of Addison Street. They can service as far north as Evanston.

The maximum number of barges permitted in tows on portions of the Waterway are as follows:

Portion of Waterway	Maximum Number of Barges in a Tow
North of Addison Street	1
Addison Street to Ogden Avenue	1
Ogden Avenue to Western Avenue	2
Western Avenue to Lockport	8
Calumet Sag Channel and Little Calumet River	8*
Lockport to Dresden Lock	15

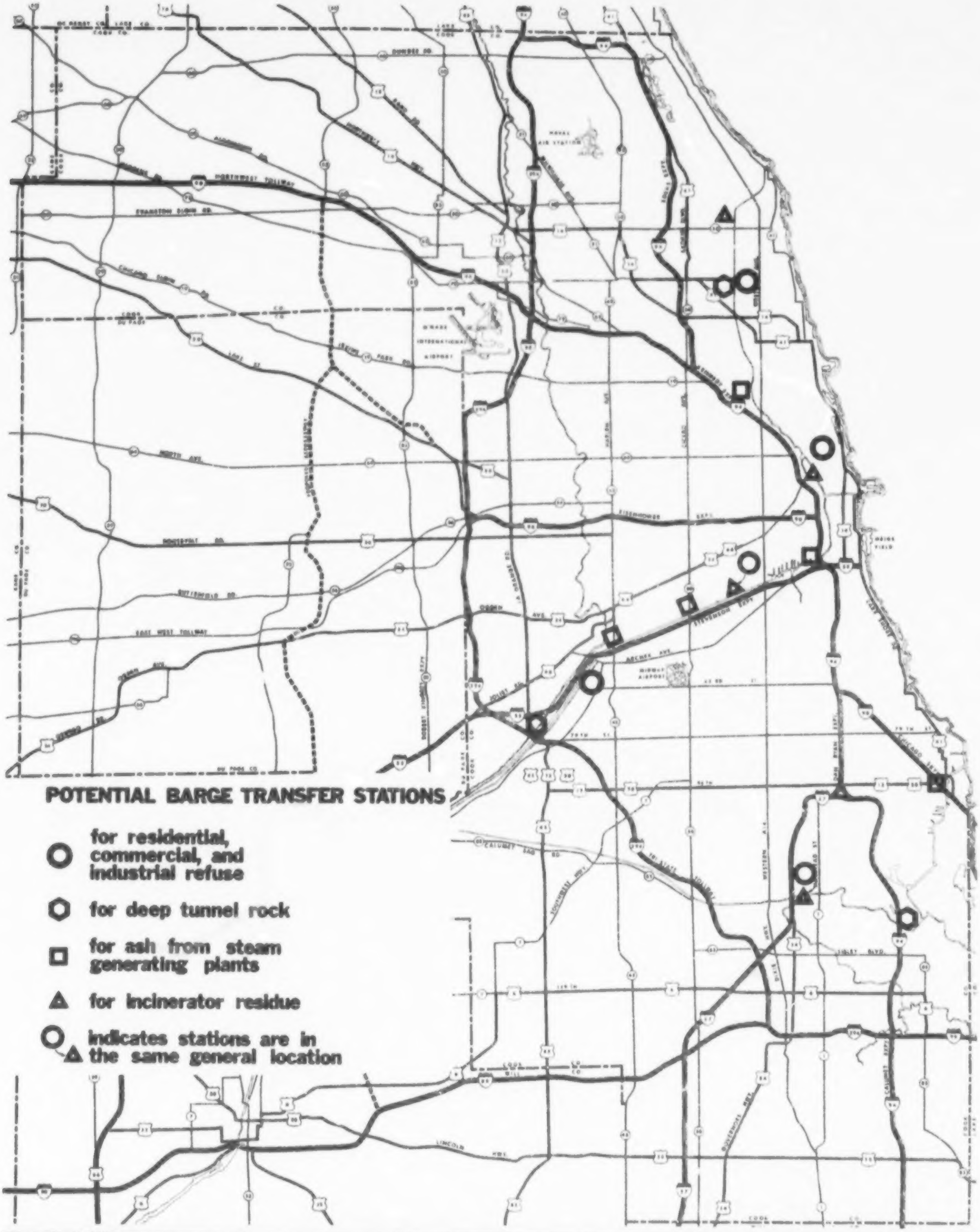
* After completion of current channel improvement program.

The U.S. Corps of Engineers advises that although normal increase in barge traffic is predicted to reach the practical capacity of the Lockport and Brandon locks by 1980, two factors may make it possible to transport a substantial quantity of solid wastes by barge. First, most of the barges that deliver coal and aggregate to Cook County are empty on the downstream trip and might be used for hauling solid wastes. The Corps of Engineers estimates that 12 to 13 million tons is the maximum annual quantity of solid waste that might be handled by existing Waterway facilities. Second, construction of duplicate locks and other improvements programed for completion within the next 10 years will greatly increase capacity of the Waterway.

The Waterway is sufficiently ice-free for year-around barge operation in the project area; however, during extremely cold weather traffic is sometimes interrupted by lack of visibility due to fog rising from the water warmed by industrial wastewater. During January 1970, barge traffic was halted by lack of visibility for a continuous period of four days. High winds and flood flows also cause minor interruptions of barge traffic. Because of these interruptions, barging under present conditions is not considered sufficiently reliable for transporting residential, commercial and industrial wastes containing putrescible materials which require prompt removal for protection of public health. Reliability of barging is considered adequate for transporting relatively inert solids such as rock, power plant ash, and demolition material.

The unit cost of transporting material by barge is affected significantly by density of the material since the cost of owning and moving a barge is essentially the same regardless of pay load. Therefore, the cost of barge transportation was estimated for five categories of solid wastes representing the probable range of refuse densities and pay loads, as follows: tunnel rock, power plant ash, incinerator residue, baled refuse, and containerized refuse.

1. **Rock and Ashes.** Rock and power plant ashes are dense enough to load a standard hopper barge to its maximum capacity of 1,400 tons. Because these materials are relatively inert, they could be transported in open



POTENTIAL BARGE TRANSFER STATIONS

- ○ for residential, commercial, and industrial refuse
- ⬡ for deep tunnel rock
- □ for ash from steam generating plants
- △ for incinerator residue
- ○△ indicates stations are in the same general location

GENERALIZED LOCATIONS FOR POTENTIAL BARGE TRANSFER STATIONS

FIGURE IV-2

barges without causing pollution, although covering will be required to prevent blowing of ashes. A rigid hauling schedule would not be required for sanitary reasons, and interruptions of barge traffic would not be serious enough to preclude this mode of transportation for inert wastes. A loading station for rock or ash would consist of barge docking facilities, provisions for discharging the material from trucks or other conveyances directly into the barge, and means for trimming the load on the barge.

At the disposal site, rock and ash would be unloaded from barges by crane and hauled to the final disposal area in off-highway mining trucks of approximately 100 tons pay load capacity.

2. **Incinerator Residue.** By use of sideboards, barges can be loaded with 1,000 tons of incinerator residue. This compares with a 1,400 ton pay load for rock. However, since some residue contains putrescible matter which attracts flies and emits odors, slow barge transportation would not be acceptable for residue unless it were thoroughly combusted.

3. **Baled Refuse.** The general run of residential refuse might be baled to an average density of about 60 pounds per cubic foot, or 1,600 pounds per cubic yard, and a pay load of 1,200 tons of bales achieved for standard hopper barges. Baled refuse could be transported without significant pollution hazard although covering would be required to prevent blowing of paper or other materials raveled from exposed bale surfaces.

Refuse would be baled at transfer stations prior to loading onto barges. Transfer stations would include barge docks and facilities for loading bales. At the disposal site, bales would be unloaded by crane onto large off-highway trucks for hauling to the final disposal area. Modified fork lift or log stacking type equipment might be used to remove bales from trucks and place them in the fill.

4. **Containerized Refuse.** Consideration was given to loading residential, commercial and industrial refuse at transfer stations into fully enclosed steel containers by hydraulic ram compactors to an average density of 650 pounds per cubic yard and transporting by barge to the proposed solid waste mountain site. Containerization would increase refuse density and provide sanitary and litter-free transportation, unloading and conveyance from barges to

the final disposal area. Containerization also might overcome some of the objection of delays in barging this type of refuse.

Pay load estimates were based on containers measuring about 8' x 9' x 23' outside and having a capacity of about 43 cubic yards, 42 containers on a standard barge, a gross pay load of 800 tons, and an average net refuse load of 600 tons per barge.

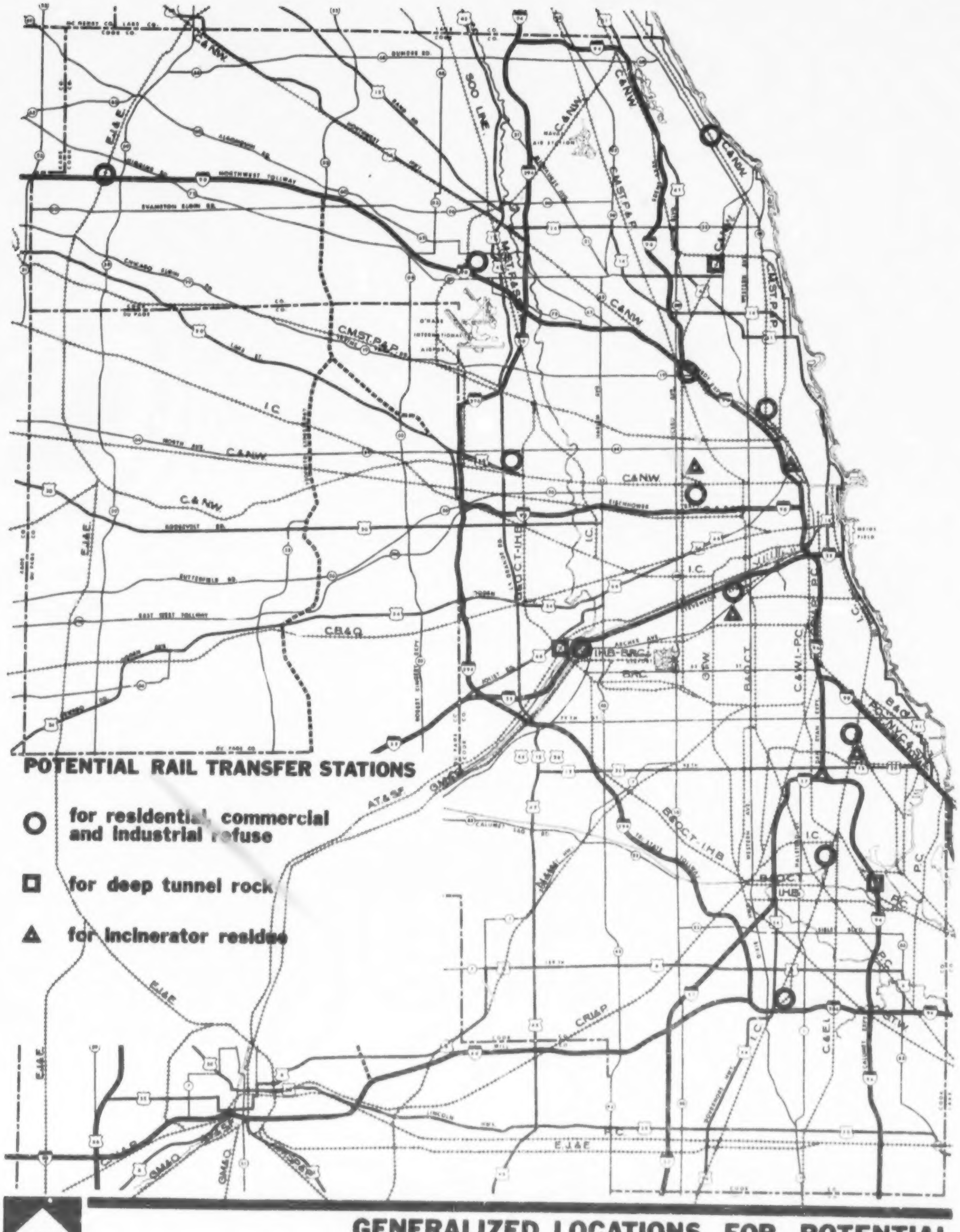
Containers would be loaded and unloaded from barges by crane. Large off-highway trucks would be used to haul containers from the barges to the final disposal area.

D. TRANSFER VIA RAILROAD

A number of railroads, including some operating in the Chicago area, have offered solid waste disposal service to large municipalities and metropolitan areas. In most instances, the railroads, or combinations of a railroad and a disposal contractor, offer a complete package including transfer stations located throughout the refuse generation area, rail transporation, and disposal of solid wastes by sanitary landfill.

An indication of the general magnitude of cost for such service is provided by a proposal submitted to the City of Milwaukee, Wisconsin, in 1970, of $6.20 per ton for the general run of residential refuse, tree refuse, and demolition debris for a minimum quantity of approximately 1,000,000 tons per year. The bidder offered to provide three transfer stations for receiving solid waste, transport wastes by rail to a disposal site more than 200 miles from Milwaukee, and dispose of them by sanitary landfill. No shredding, separation, or other processing of wastes was proposed. Assuming a landfill cost of approximately $1.20 per ton indicates a cost of about $5.00 per ton for receiving and transporting solid wastes from Milwaukee, with all transportation provided by a single railroad.

Different conditions for transporting Cook County solid wastes by rail would probably result in different unit costs. For example, since no single railroad has trackage located to serve all of Cook County, a number of railroads would have to be involved which would tend to increase costs. Conversely, the larger quantity of wastes and much shorter haul distance would tend to lower the unit cost.


POTENTIAL RAIL TRANSFER STATIONS
○ for residential, commercial and industrial refuse
☐ for deep tunnel rock
▲ for incinerator residue
C&NW
SOO LINE
EJ&E
CMST.P&P
MILW
I.C.
B&OCT-IHB
CB&Q
AT&SF
GM&O
CRI&P
GTW
C&WI-PC
B&OCT
IHB
BRC
B&O
PC-NYC&StL
P.C.
C&EI
NORTHWEST TOLLWAY
EAST WEST TOLLWAY
ROOSEVELT RD.
NORTH AVE.
O'HARE INTERNATIONAL AIRPORT
NORTH
0 1 2 3miles

GENERALIZED LOCATIONS FOR POTENTIAL RAIL TRANSFER STATIONS

FIGURE IV-3

Three railroad companies operating in the Chicago area made a joint study of the feasibility and cost of transporting solid wastes from Cook County to the Ski Mountain. The reports of the railroad companies are in Appendix I.

Using the data and estimated rail transportation costs furnished by the railroads and the costs for transfer and processing stations developed herein for other transportation methods, estimates were made of the cost for receiving, processing, loading, transporting by rail, unloading, and placement in the Ski Mountain of various type of solid wastes. These estimates are presented in Appendix H.

Generalized locations for potential solid waste transfer and processing station for rail transportation are indicated on Figure IV-3.

E. PIPELINE SLURRY TRANSPORT

A preliminary evaluation was made of transporting solid wastes in a slurry through pipelines to the proposed Ski Mountain. Because this method has been only meagerly researched for transporting heterogeneous solid wastes and there have been no field scale installations for this purpose, the evaluation is based on numerous assumptions. An estimate was made to determine the general magnitude of cost to indicate whether more detailed investigation of this transportation method was justified.

The analysis was based on a hypothetical system designed to transport 15,000 tons of solids per day through one pipeline over a distance of 53 miles, and an annual delivery of 4.2 million tons. The system would operate continuously 24 hours per day and 7 days per week to minimize the possibility of plugging in the pipeline.

1. **Description of System.** The pipeline transport system was considered in three sections: receiving and processing; pipeline and booster pumping; and separation of solids and wastewater treatment.

a. **Receiving and processing.** Ten receiving and processing stations, each designed to handle 1,500 tons of solid wastes per 24 hours, would be strategically located throughout Cook County. Residential, commercial and industrial refuse would be delivered to the stations, principally during the day shift, by refuse collection forces. Enclosed refuse storage would be provided in the stations to permit 24 hour per day operation of processing and transport systems.

Processing would be conducted in buildings and would include the following major operations:

Shredding to facilitate subsequent processing

Magnetic separation of ferrous metal for sale or disposal by other methods, supplemented by manual separation if necessary

Screening and air separation to remove glass, rock, nonferrous metal and similar high density materials for transportation by other methods

Pulping the remaining basically organic wastes and mixing with water to form a slurry

Pumping the slurry into the pipeline

Because processes for separation of solid wastes are not well developed, alternative or additional processes may be found necessary.

b. **Pipeline and booster pumping.** Analysis of pipeline and pumping facilities for delivering solid waste slurry to the disposal site was based on a single 42 inch pipeline 53 miles long. Booster pumping stations would be necessary at about 2 mile intervals. The pipeline would convey 15,000 tons of solids per day as a 6 per cent slurry, at a velocity of 10 feet per second and a pumped volume of 60 million gallons per day. Conveyance water would be taken from the Illinois Waterway near the receiving stations and returned to the Waterway near the disposal site.

c. **Separation of solids and wastewater treatment.** At the disposal site, it would be necessary to separate the solids from the liquid and treat the polluted carrier water to a quality acceptable for discharge into the Waterway. The portion of the Waterway adjacent to the site is designated an Industrial Water Supply Sector by the Illinois Sanitary Water Board. Water quality standards for the rivers are set forth in Rules and Regulations SWB-8 promulgated by the Board.

Analysis of separation and wastewater treatment was premised on use of the following facilities:

> *Grit tanks* to remove heavy solids and small particles of dense materials such as ashes, sand, glass, gravel, tramp metal, ceramics, and synthetics which may settle to the bottom under conditions of relative quiescence
>
> *Pulp dewatering equipment* similar to the helical screw presses or disc presses used by the pulp and paper industry, to dewater the bulk of the predominantly organic wastes in the slurry
>
> *Sedimentation tanks* to remove additional solids and reduce the solids contents of the effluent discharged to subsequent wastewater treatment units
>
> *Thickening tanks* to concentrate solids removed in the sedimentation tanks prior to recycling these solids through the pulp dewatering equipment
>
> *Activated sludge units* consisting of aeration tanks and final clarifiers to biologically oxidized organic pollution in the carrier water, with any settled solids being recycled through the thickening tanks and the pulp dewatering equipment
>
> *Chlorination* for control of biological pollution

2. **Evaluation.** Pipeline slurry transport would require processes and equipment not yet tested and proven satisfactory on an operational scale. Extensive full scale testing and equipment modification, or development of new equipment, would be required before a pipeline slurry transport system could be designed and constructed with reasonable assurance of successful operation.

Plugging, breakage, or other failure of the slurry pipeline would halt refuse disposal service for the entire community served by it. A standby pipeline might be required to insure reliability of service. The cost of a standby pipeline was not included in the cost estimate.

Because the system has not been proven for handling solid wastes, and will increase the problems of water pollution control, pipeline slurry transport is not considered a satisfactory method for transporting Cook County solid wastes to the proposed Ski Mountain site.

F. OTHER TRANSPORT SYSTEMS

Two transport systems were considered and rejected on the basis of preliminary evaluation.

Pneumatic conveyance in pipelines was considered impractical because power requirements would be excessive and present equipment limits conveying runs to a few thousand feet between compressor stations. A pneumatic pipeline 53 miles long would require a multitude of compressor stations operating in series. Each station would require cyclones to separate solids from the conveying air and air locks to reintroduce solids into the high pressure air stream on the discharge side of the station. In addition, each station would require high efficiency dust collectors for dust not captured by the cyclone separators, which are inefficient on particle sizes smaller than 10 microns. High moisture content of the refuse might prevent use of economical cloth bag collectors because the moisture would blind the pores of the cloth. Electrostatic precipitators would be uneconomical, and wet collectors would form sludge which would lead to additional disposal problems.

Belt conveyors were considered impractical because of the difficulty and cost of acquiring right-of-way across densely built-up urban areas; cost of constructing and operating the multiple-belt conveyors required to transport the large quantity of low density material; litter and dust problems, particularly at belt transfer points; odor problems; and fire and dust explosion hazards. A conveyor system requiring completely new right-of-way and complete construction of all facilities would face a significant cost disadvantage in competing with rail or barge transportation systems operating over existing tracks or waterways, the cost of which would be shared by other traffic.

G. COMPARISON OF TRANSPORTATION SYSTEMS

Table IV-1 shows a comparison of the average estimated costs for various methods of processing and transporting Cook County solid waste to the proposed Ski Mountain. These costs were calculated from the cost curves and tables presented in Appendix H and are averages for all of Cook County. Unless otherwise indicated, the estimates include all costs from the time materials are received at a transfer station until discharged into the Ski Mountain. Costs of spreading, compacting, tilling and other subsequent operations are not included. Table IV-1 shows the total estimated capital and operating cost per ton of solid waste transported, and the estimated capital investment required per 1,000 tons per day of transportation capacity for average daily conditions, including the capability to handle peak daily quantities 30 per cent greater than average.

Barge transportation is indicated to be the lowest cost method for delivering high density materials such as deep tunnel rock, incinerator residue, and power plant ash to the Ski Mountain site. The waterways on which barges must travel are also favorably located with respect to the origination points of these materials. Barge transportation should be used to the maximum practical extent for delivering dense inorganic materials to the Ski Mountain. As discussed previously, due to traffic limitations of the Illinois Waterway, maximum annual delivery of solid waste would be restricted to about 13 million tons until planned improvements to the Waterway are completed by about 1980. This rate of annual delivery could be achieved only by utilizing some of the existing coal and aggregate barges which are now empty on the down-river trip.

Prolonged interruption of barge traffic caused by poor visibility in extremely cold weather makes barge transportation unsuitable for moving the general run of residential, commercial, and industrial refuse even if the wastes

Table IV-1

COMPARATIVE COSTS FOR RECEIVING, PROCESSING AND TRANSPORTING COOK COUNTY MATERIALS TO THE SKI MOUNTAIN

RESIDENTIAL, COMMERCIAL AND INDUSTRIAL SOLID WASTES

Transport Method	Capital Investment per 1,000 Tons per Day of Average Daily Capacity****	Average Total Cost per Ton of Material Transported
	$1,000	$/ton
Direct haul of unprocessed refuse in 25 cubic yard compactor truck, 2-man crew, 6 ton pay load	N.A.	12.60
Highway transfer of unprocessed refuse in semitrailers, 16 ton pay load	4,930	6.68
Highway transfer of baled refuse in semitrailers, 25 ton pay load, including baling	7,055	7.00
Highway transfer of separated refuse in semitrailers, including separation	8,520	11.05
Barge transfer of baled refuse, including baling	6,310	5.75
Barge transfer of containerized refuse	6,040	6.13
Railroad transfer of baled refuse, including baling	7,270	5.57
Railroad transfer of containerized refuse	5,260	4.04
Railroad transfer of separated refuse, including separation	9,520	7.76
Pipeline slurry transport	18,200	11.20

ROCK, ASH AND INCINERATOR RESIDUE

	Capital Investment per 1,000 Tons per Day of Average Daily Capacity****			Average Total Cost per Ton of Material Transported****		
Transport Method	Deep Tunnel Rock	Incinerator Residue	Power Plant Ash	Deep Tunnel Rock	Incinerator Residue	Power Plant Ash
	$1,000	$1,000	$1,000	$/ton	$/ton	$/ton
Highway semitrailer*	347	532	378	2.83**	4.29***	3.30**
Barge	606	4,801	4,350	0.96	2.28	2.00
Railroad	679	4,377	3,345	1.16	3.41	2.08

N.A. Not applicable.
* No transfer station included.
** 33 cu yd semitrailer, 22 ton pay load.
*** 33 cu yd semitrailer, 17 ton pay load.
**** Annual tonnage divided by 365 days.

are containerized or in a form which precludes development of unsanitary conditions during transit. Portection of public health requires that the transportation system be highly reliable so that wastes can be removed promptly and prolonged accumulations of wastes in urban areas are avoided. Lack of flexibility in locating barge transfer stations and the resultant long haul distance required for collection vehicles are also decided disadvantages of barge transportation for these materials.

Transfer via highway semitrailers and transfer via rail cars are both considered suitable methods for delivering residential, commercial, and industrial refuse to the Ski Mountain. Because transportation via rail is indicated to be lower in cost, evaluation of the Ski Mountain concept was premised on transferring residential, commercial, and industrial refuse and combustible demolition debris from Cook County via railroad cars.

Although rail transport would be less flexible than highway transport, it would have the advantage of a much lower volume of refuse vehicle traffic on the highways leading to the Ski Mountain site. Less littering and other inconvenience along highways and roads leading to the site would also result from rail transport.

V. THE SKI MOUNTAIN PLAN

The solid wastes of Cook County would be separated into two categories: inorganic materials and organic materials. The inorganic fraction would consist principally of such materials as metals, glass, ashes, ceramics, soil, concrete, masonry, rubber and heavy plastics. The organics would consist principally of paper, cardboard, cloth, wood, grass, brush, leaves, food wastes and light plastics. Complete separation of organic and inorganic materials would be neither practical nor necessary. The separated materials would be salvaged to the maximum practical extent. The remainder of the inorganic materials would be used to construct a 1,000-foot high mountain for skiing and other outdoor recreation. Unsalvaged organic material would be returned to the land.

The system to accomplish these objectives would require the following major operations:

Receiving, processing, and transportation of materials
Construction of the Ski Mountain
Placing organic materials on the land

A public agency would be established to manage all operations. The agency would own all land, equipment, and other facilities required for the entire system except that tugs and existing railroad trackage would be provided and operated, under contract, by private contractors.

Analysis of the system was premised on handling the total projected 1975 quantities of Cook County solid waste, assuming that none of these wastes would be incinerated or disposed of in other landfills.

A. RECEIVING, PROCESSING AND TRANSPORTATION

To minimize transportation costs, most of the solid waste from Cook County would be delivered to transfer stations strategically located throughout the area of production. Potential transportation systems are described

Table V-1

PROJECTED QUANTITIES OF ORGANIC AND INORGANIC SOLID WASTES FOR COOK COUNTY

Year	Residential, Commercial, and Industrial Solid Waste and Demolition Debris						Ashes, Dredgings, and Screenings			Deep Tunnel Rock			Total Inorganic Solid Wastes		
		Organics		Inorganics				Required Landfill Volume			Required Landfill Volume			Required Landfill Volume	
					Required Landfill Volume										
	Total Annual Quantity	Annual Quantity	Cumulative	Annual Quantity	Annual	Cumulative	Annual Quantity	Annual	Cumulative	Annual Quantity	Annual	Cumulative	Annual Quantity	Annual	Cumulative
	1,000 tons	1,000 tons	1,000 tons	1,000 tons	acre-feet	acre-feet	1,000 tons	acre-feet	acre-feet	1,000 tons	acre-feet	acre-feet	1,000 tons	acre-feet	acre-feet
1971	5,677	4,258	4,258	1,419	710	710	1,169	590	590	–	–	–	2,588	1,300	1,300
1972	5,824	4,368	8,626	1,456	728	1,438	1,190	595	1,185	–	–	–	2,646	1,323	2,623
1973	5,970	4,478	13,104	1,492	746	2,184	1,193	596	1,781	–	–	–	2,685	1,342	3,965
1974	6,116	4,587	17,691	1,529	764	2,948	1,196	598	2,379	–	–	–	2,725	1,362	5,327
1975	6,266	4,700	22,391	1,566	783	3,731	1,199	600	2,979	20,000	7,700	7,700	22,765	9,083	14,410
1976	6,418	4,814	27,205	1,604	802	4,533	1,201	600	3,579	20,000	7,700	15,400	22,805	9,102	23,512
1977	6,572	4,929	32,134	1,643	822	5,355	1,204	602	4,181	20,000	7,700	23,100	22,847	9,124	32,636
1978	6,725	5,044	37,178	1,681	840	6,195	1,207	604	4,785	20,000	7,700	30,800	22,888	9,144	41,780
1979	6,880	5,160	42,338	1,720	860	7,055	1,210	605	5,390	20,000	7,700	38,500	22,930	9,165	50,945
1980	7,036	5,297	47,635	1,759	880	7,935	1,213	606	5,996	20,000	7,700	46,200	22,972	9,186	60,131
1981	7,192	5,394	53,029	1,798	899	8,834	1,216	608	6,604	20,000	7,700	53,900	23,014	9,207	69,338
1982	7,349	5,512	58,541	1,837	918	9,752	1,219	610	7,214	20,000	7,700	61,600	23,056	9,228	78,566
1983	7,508	5,631	64,172	1,877	938	10,690	1,222	611	7,825	20,000	7,700	69,300	23,099	9,249	87,815
1984	7,667	5,750	69,922	1,917	958	11,648	1,225	612	8,437	20,000	7,700	77,000	23,142	9,270	97,085
1985	7,827	5,870	75,792	1,957	978	12,626	1,228	614	9,051	–	–	–	3,185	1,592	98,677
1986	7,985	5,989	81,781	1,996	998	13,624	1,231	616	9,667	–	–	77,000	3,227	1,614	100,291
1987	8,146	6,110	87,891	2,036	1,018	14,642	1,234	617	10,284	–	–	77,000	3,270	1,635	101,926
1988	8,307	6,230	94,121	2,077	1,038	15,680	1,236	618	10,902	–	–	77,000	3,313	1,656	103,582
1989	8,468	6,351	100,472	2,117	1,058	16,738	1,239	620	11,522	–	–	77,000	3,356	1,678	105,260
1990	8,628	6,471	106,943	2,157	1,078	17,816	1,242	621	12,143	–	–	77,000	3,399	1,699	106,959
1991	8,793	6,595	113,538	2,198	1,099	18,915	1,245	622	12,765	–	–	77,000	3,443	1,721	108,680
1992	8,957	6,718	120,256	2,239	1,120	20,035	1,247	624	13,389	–	–	77,000	3,486	1,744	110,424
1993	9,121	6,841	127,097	2,280	1,140	21,175	1,250	625	14,014	–	–	77,000	3,530	1,765	112,189
1994	9,284	6,963	134,060	2,321	1,160	22,335	1,253	626	14,640	–	–	77,000	3,574	1,786	113,975
1995	9,451	7,088	141,148	2,363	1,182	23,517	1,256	628	15,268	–	–	77,000	3,619	1,810	115,785

and generalized locations for transfer stations for highway, rail, and barge transportation are given in Section IV. Methods for estimating the cost of transport by these systems are presented in Appendix H.

Table V-1 shows the projected annual quantities of organic and inorganic materials from Cook County and the volume that the inorganic materials would occupy in the Ski Mountain excluding any cover material obtained outside the fill space. Excavation for cover material within the fill space results in an equal volume of fill space which offsets the space that cover material occupies in the fill. Volume requirements were based on average densities in the mountain, as follows:

	Average Density*	
	Pounds per Cubic Yard	Tons per Acre-foot
Rock	3,200	2,600
Other inorganics	2,500	2,000

* See Table I-6 for references.

1. **Barge Transportation.** High density materials such as Deep Tunnel rock, power plant ash, and noncombustible demolition debris would be delivered to barge loading stations on the Waterway. These are primarily inorganic materials and would require no separation or processing prior to being placed in the mountain.

Barge loading stations would be located as close as possible to the sources of solid wastes to minimize the cost of delivering material to the barges. Generalized locations for potential barge loading stations are shown on Figure IV-2. Barge loading stations would not be provided for the general run of residential, commercial and industrial refuse.

The estimated capital investment, annual cost, and unit cost for transporting projected 1975 quantities of power plant ashes, screenings, sweepings and Deep Tunnel rock to the Ski Mountain are as follows:

	Annual Quantity tons	Capital Investment $	Annual Cost $	Unit Cost $/ton
Power plant ash, screenings, and sweepings	847,000	11,790,000	1,693,000	2.00
Deep Tunnel rock	20,000,000	33,200,000	19,100,000	0.96

2. **Railroad Transportation.** Residential, commercial, and industrial refuse and combustible demolition debris would be received at transfer stations designed to separate organic materials from inorganic materials and to load each separately into rail cars. The relatively stable inorganic material would be transported to and placed in the solid waste mountain. Organic materials would be transported to and deposited on land into which it would be tilled. Initially, a portion of the Ski Mountain site could be used to receive organics; however additional land would be required for this purpose, as discussed later in this section.

a. **Transfer.** Twelve transfer stations, with capacities ranging from 1,000 to 2,500 tons of refuse per average day, would be provided initially for the 6,266,000 tons of residential, commercial, and industrial refuse and combustible demolition debris projected for 1975. Generalized locations for rail transfer stations are indicated on Figure IV-3.

b. **Separation.** Separation of heterogenous solid waste into organic and inorganic fractions will be necessary to reclaim and reuse materials and to obtain relatively stable materials for constructing the Ski Mountain. Complete separation will be neither practical nor necessary; however, the fill material must be sufficiently free of organic material to be structurally stable in deep fills. It will be necessary to determine experimentally the required degree of separation to yield stable fill material.

Systems for separation of solid waste into organics and inorganic fractions on an operating scale have not been developed. The general state of the art of solid waste separation was reviewed by Drobny, Hull and Testin, who reported:(1)

> *As of 1968, the most widely employed means for separating solid waste is handpicking and sorting from conveyors. ---- very few of the more sophisticated separation techniques have been applied to solid waste processing and the historical experience of these applications is extremely limited. Generally speaking, there is almost a universal lack of data related to mechanical separation of solid waste. ---- several potentially promising separation techniques are available; but additional experimental work is required to establish performance criteria and cost relationships suitable for design purposes.*

To achieve the required degree of separation, it will be necessary to develop an operable system. Preliminary cost estimates for this study were based on the assumption that residential, commercial and industrial refuse and combustible demolition debris would be shredded and then separated by a combination of methods, including air classification, magnetic separation, and screening. The cost estimates are necessarily approximations.

To minimize materials handling, which according to Drobny is a major cost factor in solid waste processing,(2) the study was premised on shredding and separating at the transfer stations where it would be necessary that the materials be rehandled anyway to transfer them from collection vehicles to rail cars. Preprocessing at the transfer stations would facilitate subsequent handling and transportation and would make it possible to haul material directly to the final placement areas, obviating the rehandling that would be required if unprocessed refuse were delivered to the Ski Mountain site and separated there. It is possible that detailed planning and design of the Ski Mountain system will show that a central shredding and separation station at the Ski Mountain site would be more feasible. However, considering the

---

1. Drobny, N. L., H. E. Hull, and R. F. Testin. Recovery and utilization of municipal solid waste; a summary of available cost and performance characteristics of unit processes and systems. Public Health Service Publication No. 1908. Washington, U.S. Government Printing Office, 1971. p.23-53.

2. Drobny. Recovery and utilization of municipal solid waste, p.27, 51.

present undeveloped state of solid waste salvage markets and of the technology of solid waste separation, it would not be possible at this time to determine definitely the most feasible location for these processing facilities.

Shredding will be necessary to tear open packages and to reduce material to sizes which can be processed by mechanical separation devices. Size reduction will produce other benefits, including higher material density in transport systems and in the solid waste mountain, reduced blowing and littering of materials, reduced odor and attraction for vermin, and more rapid biological stabilization of organics placed on the land.

Shredding equipment has been successfully demonstrated for size reduction of refuse in a number of compost plants, and the City of Madison, Wisconsin has conducted extensive investigations on shredding of solid waste.(1) Numerous heavy-duty shredders are also being used to reduce auto bodies to hand-size scrap metal.

Although there are several types of size reduction equipment, hammermills are used in about 90 per cent of existing solid waste shredding installations.(2) The principal reason for the predominant use of hammermills is the heavier construction of this type machine which gives it the ability to process the wide range of materials found in solid wastes. Knife type shredders, widely used in industrial applications, are generally not suitable because the knives are rapidly dulled and damaged by objects in mixed refuse.

Separation techniques depend upon detecting and acting upon differences in certain characteristics of the materials being separated, such as particle size, friability, surface characteristics, specific gravity, and magnetic properties. Because, in most instances, the materials to be separated are not sufficiently unique to permit complete separation by any one technique, a number of stages using different methods will probably be required to achieve an acceptable degree of separation.

1. Solid waste reduction/salvage plant; an interim report; City of Madison pilot plant demonstration project, June 14 to December 31, 1967. Cincinnati, U.S. Department of Health, Education, and Welfare, 1968. 25 p.

2. Drobny, Recovery and utilization of municipal solid waste, p.8.

Magnetic separation of ferrous metals from incinerator residue, shredded auto scrap, shredded refuse, and compost has been accomplished successfully in a number of solid waste processing plants.(1) Although magnetic properties are sufficiently unique to permit a relatively high degree of separation of ferrous metals, the metal scrap may contain enough entrapped organic fibers and other foreign material to necessitate additional separation.

Air classification separates materials according to density, size and aerodynamic properties. Experimental work has demonstrated that high density materials such as glass, dirt, metallics, and rocks can be readily separated from dry shredded municipal refuse by air classification.(2)

Screening separates materials on the basis of particle size and has been used in the processing of shredded solid waste and compost at composting plants. Screening may be used for separating oversize objects for further size reduction; however, one of its principal applications would appear to be for removing brittle materials such as glass, ceramics, brick, masonry, and thermosetting plastics which are shattered to small particles by impact during size reduction. In experimental testing, the U.S. Bureau of Mines screened shredded municipal refuse through a 4-mesh screen and captured 87 per cent of the dirt and glass, contaminated by less than 4 per cent of the combustible material in the original sample.(3) The tests showed that preliminary air classification prior to screening facilitated screening by reducing moisture content of the refuse. As part of the U.S. Bureau of Mines experiments, separation of shredded minus 6-inch municipal refuse by air classification followed by magnetic separation of the heavy product and screening of other products on a 4-mesh screen obtained the following results:(3)

> The simple processing steps outlined were effective in recovering 92 per cent of the metal in a clean product. The plus

---

1. Drobny, recovery and utilization of municipal solid waste, p.25.

2. Boettcher, R. A. Air classification for reclamation processing of solid wastes. ASME Paper 69-WA/PID-9. New York, American Society of Mechanical Engineers, 1969. 12 p.

3. Dean, K. C., C. J. Caindgren, and L. Peterson. Preliminary separation of metals and nonmetals from urban refuse. U.S. Bureau of Mines Technical Progress Report 34. [Washington], June 1971. p.4, 9.

> 4-mesh elutriated product represented 97 per cent recovery of the combustibles and contained only 3 per cent of noncombustible impurities. This product should be eminently satisfactory as a fuel. The minus 4-mesh elutriated product representing only 18.7 per cent of the weight of the raw refuse could be discarded to landfill with only a 3 per cent loss of the combustibles.

Although experimental results indicate that a high degree of separation of solid wastes can be achieved, full-scale pilot systems, processing the full range of residential, commercial, and industrial refuse and combustible demolition debris, will probably be required to develop necessary design and cost parameters for constructing feasible separation facilities for the Ski Mountain project.

Preliminary cost estimates for receiving, shredding, separating as discussed, and transporting separated materials via railroad cars are given in Appendix H. The estimated capital investment, annual cost and unit cost for the projected 1975 quantity of residential, commercial, and industrial refuse and combustible demolition debris are summarized below:

	Annual Quantity tons	Capital Investment $	Annual Cost $	Unit Cost $/ton
Receive and process	6,266,000	145,000,000	38,000,000	6.06
Transport	6,266,000	18,500,000	10,650,000	1.70

B. SKI MOUNTAIN CONSTRUCTION

1. Site Acquisition and Development

a. **Site acquisition.** The land comprising the Ski Mountain site is privately owned and would have to be acquired by purchase or condemnation. As discussed in Section II, acquisition of the 7,300 acre site is estimated to cost approximately $14,000,000.

b. Subsurface investigation. Prior to actual acquisition of land, sufficient subsurface investigation should be done to verify the general suitability of the underlying geologic formations for supporting the mountain and preventing ground water pollution. Much of this preliminary investigation could be done on public road rights-of-way, but it may be necessary to make some borings on private land.

If preliminary investigations confirm the general suitability, a comprehensive investigation should be made to locate, define, and map subsurface deposits which will influence design and construction of the mountain. These might include: low strength surface deposits requiring removal so that the mountain could bear directly on high strength materials; deep deposits of low strength material which would influence design for structural stability; or highly pervious deposits requiring removal or blanketing with impervious material to prevent ground water pollution.

Based on the State EPA requirement of one test hole for each 5 acres, subsurface investigation of the 7,300 acre site is estimated to cost approximately $1,325,000.

c. Utility relocation. A number of utility easements cross the site and will conflict with Ski Mountain. Estimated relocation costs, based on on-site rights-of-way provided at no cost to the companies, were provided by the utility companies, as follows:

	Estimated Relocation Cost
	$
Natural Gas Pipe Line Company of America – three 36 inch gas pipe lines	3,580,000
Commonwealth Edison Company – existing and planned power transmission lines	5,000,000
Illinois Bell Telephone Company – microwave and other outside plant facilities	460,000
Subtotal	9,040,000
Allowance for administrative, legal, engineering, and overhead expenses	960,000
Total	$10,000,000

Copies of estimates furnished by the utility companies are included in Appendix G.

d. **Site development.** Considerable work and expense will be required to prepare the site for construction of Ski Mountain. The initial construction of the mountain would occupy an area of about one square mile at the south end of the site.

Stripping of unsuitable material and cover material from the fill area, as discussed on the following page, would be performed as a part of the fill operation and its cost was included as an operating expense.

Barge unloading facilities would be provided along the north bank of the Illinois Waterway close to the initial mountain construction where they would be screened by the Kankakee Bluffs. The costs of these facilities are included in the estimated cost of barge transport systems presented in Appendix H.

Railroad spur tracks would be extended from the existing tracks on the west side of the site to unloading facilities in the southwest corner. The unloading facilities would be close to the area of initial construction and would be screened by the bluffs. Costs of spur tracks and unloading yards are included as part of the cost of the rail transport system presented in Appendix H.

Approximately 5 miles of surfaced all-weather road would be provided from the I-80 exit north of the site to the initial fill area. Relocation of U.S. Highway 6 would be necessary eventually, but the highway could remain in service during construction of the first phase of the mountain which may require 30 years or longer. Therefore, the cost of highway relocation was not included in the initial site development cost.

Some 5 miles of security fencing would be provided around the initial mountain construction area.

Structures would be provided for a field office, employee facilities, scales, and landfill equipment servicing, complete with parking lots, area lighting and landscaping. These facilities together with fencing and the access road from I-80 were estimated to cost $1,650,000.

2. Construction

a. **Rate of filling.** If constructed with average 4:1 side slopes (4 horizontal to 1 vertical), the initial fill area of approximately one square mile at the south end of the site would reach a height of about 660 feet and contain about 140,000 acre-feet of fill.

Table V-1 shows that the projected cumulative volume of inorganic solid fill material from Cook County over the 1971-1995 period is approximately 116,000 acre-feet. Assuming that all of it is placed in the fill, the fill would rise at the rate of about 15 feet per year in the early years and completion of the initial part of the mountain would require 35 to 40 years. The initial fill would be about 7 per cent of the total volume of the Ski Mountain.

b. **Stripping.** Prior to placing fill, the area to be covered would be excavated to an average depth of at least 10 feet, and to greater depths where necessary to remove unsuitable foundation material. Because the top of the zone of saturation in this part of Illinois is generally within 5 to 10 feet of the ground surface, according to Hughes(1) dewatering may be required to provide a dry work area. Excavated material would be placed in a graded berm around the perimeter of the initial fill site and subsequently used to cover the final outside surfaces of the initial mountain to an average thickness of about 10 feet. Berms of cover material would be constructed to a height of 50 feet with 4:1 side slopes which would be planted to grass and mowed. Berms, which would be sloped to drain away from the fill area, would keep outside drainage from entering the fill site and would screen the fill operation from view for several years.

c. **Filling.** The Ski Mountain fill would rest directly on high strength glacial till and would be constructed with relatively stable,

---

1. Hughes, G. M., R. A. Landon, and R. N. Farvolden. Hydrogeology of solid waste disposal sites in northeastern Illinois; an interim report on a solid waste demonstration grant project. Cincinnati, U.S. Department of Health, Education, and Welfare, 1969. p.9.

predominantly inorganic materials such as rock, glass, ceramics, metals, ashes, brick, concrete, and earth.

Preliminary design was based on average side slopes in the range of 3:1 to 4:1 to permit mowing and maintenance. Using data obtained in the comprehensive subsurface investigation, determinations should be made of the structural properties of the underlying geologic formations and the fill materials to establish design parameters and construction procedures required to assure structural stability of the fill.

The bottom layer of fill would be rock and other highly pervious material through which water could flow laterally to a collection system at the edge of the fill. This free exit for liquids would minimize buildup of the water table within the fill and reduce the possibility of springs on the sides of the mountain. The resultant reduction of hydrostatic pressure at the base of the fill would also tend to reduce percolation through the underlying formations. The drainage layer should be the maximum thickness obtainable with the available pervious fill material.

Solid wastes would be dumped from trucks in the fill area, spread in thin layers by crawler tractors, and compacted. Ashes, inorganics separated from combined refuse, incinerator residue, and other wastes requiring daily cover would be placed in compacted cells 8 to 10 feet in depth and covered daily with earth or other suitable material in accordance with approved sanitary landfill practice. Rock, brick, concrete, and similar stable fill materials free of decomposable or combustible matter would be leveled and compacted, but would not require daily cover.

Outer edges of the fill would be carried at a higher elevation than the interior to prevent surface runoff of the fill area from flowing down and eroding the side slopes. Interior surface drainage would be diverted into sedimentation ponds at the base of the fill. The raised edge would assist in screening the fill operation from public view. Access to the working area for hauling vehicles would be provided by roads constructed on the side of the fill.

d. **Covering.** During the early years of the operation, earth excavated from the fill area would be used for covering wastes requiring daily cover. After about two years of aging in the fill, any small amount of organic matter contained in the inorganic material separated from combined refuse would become stabilized by natural biological action. After a supply of aged inorganic material becomes available, this material would be used for daily cover. As discussed in Section III under "Cover Material", aged incinerator residue and inorganic material are expected to be superior to earth for daily cover and use of these materials for cover would overcome operational difficulties that otherwise would make construction of a solid waste mountain extremely difficult.

To provide favorable conditions for the growth of a wide variety of trees, shrubbery and other vegetation the outside slope of the mountain would be covered to a depth of approximately 10 feet with earth excavated from under the fill area. Since the slope distance on a 4:1 slope is only 3 per cent greater than its horizontal projection, 10 feet of side cover would require only about 10.3 feet average depth of excavation over the fill area. Humus would be mixed with the top 24 inches of the side slope cover to provide better growth conditions for plants. A dense ground cover of grass and other plants would be established on the covered side slopes for control of runoff and erosion.

e. **Equipment.** During the initial years, the fill would be operated with the type of earthmoving equipment used on conventional sanitary landfills. It is estimated that one 385 horsepower crawler tractor and 4 twin engine wheel scrapers of 32 cubic yard struck capacity would be required to strip and stockpile unsuitable foundation material from the fill area, haul and spread cover material, and construct sedimentation and stabilization ponds for runoff and leachate.

It is estimated that 17 crawler tractors of 385 horsepower rating would be required to spread and compact the projected 1975 quantity of rock and other inorganic material shown in Table V-1.

Miscellaneous equipment would include motor graders, water trucks, fuel and servicing truck, pickup trucks, and automobiles.

The average economic life of equipment was estimated as follows: scrapers, 15,000 hours; tractors, 12,000 hours; water trucks, motor graders and servicing trucks, 10 years; and automobiles and pickup trucks, 5 years.

f. **Leachate control.** Provisions would be made for collecting and treating leachate from the mountain to minimize any possibility of water pollution.

The quality of leachate is expected to be quite varied. Because it may be impossible to eliminate completely all organic matter from the fill, leachate may contain dissolved and suspended organic matter that would exert a biochemical oxygen demand (BOD). However, due to the low proportion of organic material in the fill, the BOD is expected to be relatively low. Chemical contaminants dissolved from ash and inorganic materials may also be present.

The concentration of contaminants in leachate will be affected by numerous factors, including: types of fill material, amount of water passing through the fill, and residence time of water in the fill. Controlled experiments have shown that high BOD values, organic carbon, organic nitrogen, ammonia, chloride, sulfate, and sulfide could occur in leachate shortly after each addition of refuse to a fill.(1) A steady decrease in these parameters was noted between applications and wide variations in the quality of leachate from the same landfill have been observed. In the Ski Mountain materials would be added continously at a fairly uniform rate and all areas of the fill would probably receive one or more layers of material each year. Under these conditions the quality of leachate might tend to stabilize. However, quality characteristics of leachate can only be established from actual field experience.

---

1. Ministry of Housing and Local Government. Pollution of water by tipped refuse. Report of the Technical Committee on the experimental disposal of house refuse in wet and dry pits. London, Her Majesty's Stationary Office, 1961. p.64.

The amount of leachate anticipated has been based on reported information gathered from experience with landfill operation in northeastern Illinois where the leachate has been found to be about 15 inches of water per year.(1) For an initial fill area of about one square mile, the average leachate flow was estimated at approximately 0.7 million gallons per day (mgd).

Leachate would be collected by the highly pervious blanket of rock on the impervious glacial till foundation over the base area of the mountain. Leachate percolating down from the fill would flow horizontally through the blanket to the edges of the fill where it would be collected in pipe underdrains and pumped to the leachate treatment facilities.

The Illinois Sanitary Water Board has designated the Des Plaines and Illinois Rivers adjacent to the Ski Mountain site as an Industrial Water Supply Sector and has established water quality criteria for these streams in its "Rules and Regulations SWB-8," a copy of which is in Appendix B. The Illinois State Environmental Protection Agency advised that secondary treatment will be required for leachate discharged to these streams.(2)

The proposed treatment facility is an oxidation ditch, a modification of the activated sludge process. The facility is compact, rugged, simple in design and construction, simple to operate, flexible, provides a high degree of treatment, and can readily be fitted into the landscape. It can be easily screened and requires a minimum of operational buildings.

The oxidation ditch method requires no primary sedimentation. Aeration is provided in a continuous shallow ditch where oxgyen is transferred by cage rotors, a mechanical type of aerator. The rotor also imparts sufficient energy to the liquid to maintain an average velocity of about 1.0 foot per second. The ditch would have a concrete lining as protection against erosion. Heated housings would be placed over the rotors to prevent ice formation during winter operation.

---

1. Hughes, Landon, and Farvolden, Hydrogeology of solid waste.

2. Black & Veatch, Consulting Engineers. Correspondence, Jan. 20, 1971; see Appendix G, p.27.

A final settling tank would be provided for collection of solid material. A sludge collection mechanism would be used to remove sludge for return to the ditch or for wasting as excess sludge. Excess sludge would be treated in an aerobic digester and pumped to drying beds. Final solids disposal would be on the land.

The liquid effluent would be disinfected and used to irrigate grass or crops on the site, or discharged to the Des Plaines or Illinois Rivers.

The quality of effluent from the oxidation ditch would be comparable to that from an extended aeration facility and should meet the requirements of the Illinois Sanitary Water Board for streams in an Industrial Water Sector. However, if operating experience demonstrates that the effluent from the proposed treatment facilities contains unacceptable concentrations of heavy metals or other contaminants, chemical or other necessary treatment processes would be provided to produce an effluent of acceptable quality.

Runoff water from the active working surface of the fill would be directed to sedimentation ponds at the base of the fill. The runoff water would then flow through holding ponds constructed by damming small natural drainage courses on the site. From the holding ponds, the water would be used to irrigate grass or crops on the site, or it would be discharged to the Illinois or Des Plaines Rivers.

Leachate collection and treatment facilities were estimated to require a capital investment of $3,400,000.

3. Cost

a. **Fixed costs.** Table V-2 is a summary of the estimated initial capital investment and annual capital and operating costs for constructing the Ski Mountain, excluding the cost of crawler tractors and operators required for spreading and compacting materials in the fill. The costs in Table V-2 are relatively fixed regardless of quantity of material received, while the cost for crawler tractors and operations is variable depending on quantity of material handled.

The annual capital costs in Table V-2 are based on amortizing equipment over its normal economic life and amortizing other capital investment over a 30 year period, at a 6 per cent rate of interest, with equal annual payments of principal and interest. The labor shown in Table V-2 is for operating the disposal facility one shift, 7 days per week, and for keeping the site open at all times to receive materials.

b. **Variable costs.** Tractor requirements were based on a 385 horsepower crawler tractor being able to spread and compact 700 acre-feet of rock or 600 acre-feet of other inorganic material annually, and one standby unit for each 6 operating tractors. The 17 crawler tractors and 14 operators required to spread and compact the projected 1975 quantity of inorganic material are estimated to add the following costs:

Capital investment	$2,040,000
Annual capital cost	328,000
Annual operating expense	403,000
Total annual cost	$731,000

c. **Unit costs.** Figure V-1 shows the estimated variation in unit cost for placing materials in the Ski Mountain due to variation in quantity. The unit costs include both fixed and variable costs. Separate curves are shown for rock and for other predominantly inorganic materials. A lower unit cost is indicated for rock because a ton of rock will occupy less volume in the fill and will not require daily cover.

C. RETURNING ORGANIC MATERIAL TO THE LAND

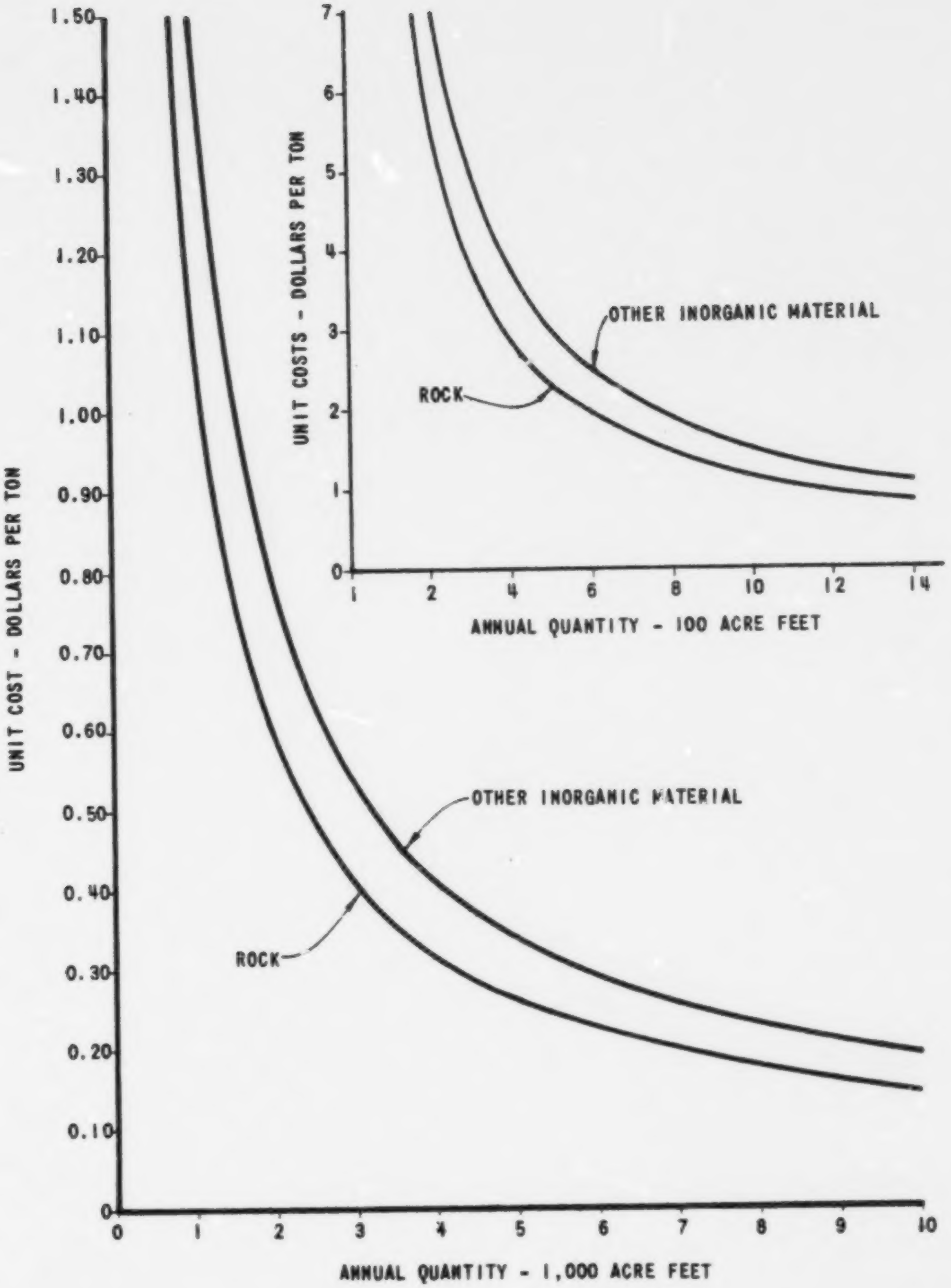
Under the Ski Mountain concept, the organic fraction of solid waste not salvaged for re-use would be placed on land and tilled into the top few inches of soil where it would undergo aerobic degradation and conversion to humus. This would be a modification of the accepted practice of processing refuse into compost and placing the compost on land to improve plant

Table V-2

ESTIMATED FIXED ON-SITE COSTS FOR CONSTRUCTING THE SKI MOUNTAIN

			Estimated Costs*	
			Initial Cost $	Annual Cost $
CAPITAL COSTS				
Land			14,000,000	1,016,400
Subsurface Investigation			1,325,000	96,200
Office and Service Building			300,000	21,800
Roads, Parking, Fencing, etc.			1,350,000	98,000
Pollution Control			3,400,000	246,800
Utility Relocations			10,000,000	726,000
Landfill Equipment			975,000	133,300
Subtotal – Capital Costs			31,350,000	2,338,500
OPERATING EXPENSE*				
Labor				
Superintendent	1	20,000		
Foreman, general	1	16,900		
Foreman, shift	3	44,400		
Equipment operator	4	68,400		
Truck driver	1	12,300		
Mechanic	2	35,600		
Laborer	5	58,000		
Scaleman	3	26,100		
Clerk	1	6,500		
Subtotal for 5 Day Week		288,200		
Add for 7 Day Week		115,300		
Subtotal – Labor				403,500
Utilities				65,000
Maintenance, materials, supplies				143,000
Subtotal – Operating Expense				611,500
ANNUAL COST				2,950,000

* Excludes tractors and operators for spreading and compacting.



ESTIMATED UNIT COSTS
FOR CONSTRUCTING THE SKI MOUNTAIN

FIGURE V-1

growth. The major differences would be that much of the cost of composting would be eliminated, stabilization of organic matter would occur in the soil rather than in a composting plant, and the land would be used as an acceptor, degrader, and stabilizer of wastes rather than to grow crops. Organic matter would be added each year at the sustained assimulative capacity of the land so that the land would not be lost to future crop production or other uses.

This method of returning organic waste material to the land has not yet been developed and tested to the point of large scale application. However, research by Hart, et al, suggests that the concept offers potential for pollution free disposal of wastes without destroying the usefulness of land.(1)(2) The researchers recognize that much additional work will be required to develop design and cost parameters.

1. **Processing.** Residential, commercial, and industrial refuse would be processed at receiving stations near the area of generation by shredding and separation of the organic and inorganic fractions. Shredding makes the material easier to handle, decreases attraction for flies and rodents, reduces susceptibility to blowing when placed on the land, facilitates mixing with soil, and increases the rate of stabilization.

Shredded organic wastes would be spread on the land and worked into the top several inches of soil on a daily basis, except when prevented by inclement weather. Temporary stockpiling would be required when weather prevented direct application to the soil.

2. **Land Requirement.** The projected production of organic waste in Cook County is 4.7 million tons in 1975 and 7.1 million tons in 1995. Assuming an annual application rate of 200 tons of organic material per acre,

---

1. Hart, S. A., W. J. Flocker, and G. K. York. Refuse stabilization in the land. Compost Science, 11(1):4-8, Jan.-Feb. 1970.

2. Tietjen, C., and S. A. Hart. Compost for agricultural land? Journal of the Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, 95(SA2): 269-287, Apr. 1969.

the land requirement would be about 25,000 acres in 1975 and 40,000 acres in 1995. These acreages include allowances for buffer strips around the site perimeter and some area for drainage control.

Designation of a site or sites for returning organic material to the land was outside the scope of this report. However, it would appear possible to use approximately 5,000 acres of the mountain site for this purpose during the first 35 years of operation. Additional farm land in the same general vicinity might be acquired to meet the remaining requirement. Returning organic material to strip mine land would appear doubly advantageous as it would obviate taking existing farm land out of production and it would help reclaim virtually useless land.

Research conducted at the University of Kansas indicates that aerobic stabilization of shredded organic solid wastes of residential origin occurs in approximately 40 days during warm weather and in approximately 120 days during the winter.(1) If further research shows that shredded organic wastes can be applied to the same land more frequently than once a year, the required land area might be substantially reduced.

Investigations by MSDGC indicate that nitrogen in digested sewage sludge is the limiting factor in the rate of sludge application to land areas.(2) On the other hand, organic solid waste is deficient in nitrogen. For these reasons, some economy might be realized by applying both organic waste and sludge to the same land area.

3. **Pollution Control.** The feasibility of returning organic material to the land is partially dependent upon limiting environmental pollution to meet established standards.

a. **Air pollution.** The primary potential hazard to air quality would be the emission of odors from wastes spread on the land.

1. Tilsworth, T. Aerobic surface stabilization of refuse. Ph.D. Thesis, University of Kansas, Lawrence, 1970. p.182.

2. Utilization of liquid fertilizer. Metropolitan Sanitary District of Greater Chicago, Engineering Department, [1970]. p.5.

Available research data indicate that odors from the disposal operation would not be a problem.(1) Odors have been reported not to be an appreciable problem at the solid waste project in Madison, Wisconsin where shredded wastes are placed in landfills several feet deep and are not covered or worked into the soil.(2)

Blowing of dust and litter could be minimized by establishing windbreaks of trees and other plants around and through the site.

b. Water pollution. Absence of water pollution could be assured if no aquifer existed under the site or if existing aquifers were protected by impervious formations, and if precipitation could be retained on the site and off-site drainage excluded.

Since much of the land in Illinois is not underlain by a usable aquifer, placing organic material on such land would not endanger usable ground water. Precipitation in the vicinity of the proposed Ski Mountain site averages approximately 33 inches per year and reaches a maximum of approximately 48 inches at average reoccurrence intervals of about 50 years. This precipitation is dispersed through evaporation, transpiration, recharge to ground water, and runoff. Evapo-transpiration is estimated to average approximately 75 per cent of the precipitation in an average year. In the absence of storage, approximately 25 per cent of the precipitation would be expected to occur as runoff from the land area in a normal year. In an extremely wet year, 50 per cent of the rainfall might leave the land as runoff.

Water quality standards designate the Illinois River downstream from the Chicago Sanitary and Ship Canal to the mouth of the Fox River as an Industrial Water Supply Sector. Stream standards for an Industrial Water Supply Sector are included in Appendix B.

Runoff from the organic disposal area could reach the stream by surface flow or by percolation through the soil and subsequently discharge to the

---

1. Hart, S. A., W. J. Flocker, and G. K. York. Refuse stabilization in the land. Compost Science, 11(1):6, Jan.-Feb. 1970.

2. Solid waste reduction/salvage plant; an interim report: City of Madison pilot plant demonstration project, June 14 to December 31, 1967. Cincinnati, U.S. Department of Health, Education, and Welfare, 1968. p.8.

stream. Water percolating through the soil would be expected to be relatively free of bacteriological and organic pollution but could have a significant concentration of dissolved salts. Surface runoff might contain quantities of chemical, organic, and bacteriological pollution in excess of that allowed in the receiving stream. Design procedures necessary to insure an acceptable quality runoff could be determined only by selecting a specific land area and establishing a test program to obtain data on runoff characteristics. It would then be possible to establish control procedures and, if necessary, treatment methods.

It is anticipated that the most practical means for controlling pollution from surface runoff would consist of impounding water that was unacceptable for discharge into the receiving streams. The impounded water could be returned to the land by irrigation, held in the impoundment until it had stabilized, or until flows were such that it could be discharged to the receiving stream.

4. **Cost.** In the absence of a specific site on which to place organic material, the land cost for this purpose was estimated on the basis of purchasing 25,000 acres of agricultural land at $1,000 per acre and amortizing the cost of $25,000,000 over a 30 year period, at a 6 per cent rate of interest, with equal annual payments of principal and interest. The capital cost of equipment to operate the organic farm was estimated at approximately $1,000,000.

In a preliminary economic analysis of the unit processes of returning organic material to the land, Golueke and McGauhey, estimated the operating cost of field spreading and tilling at approximately $1.50 per ton.(1) The estimate included spreading, plowing twice, irrigating three times, and applying 300 pounds of nitrogen fertilizer per acre for an annual application of 200 tons of organic material per acre.

---

1. Golueke, C. G., and P. H. McGauhey. Comprehensive studies of solid waste management; first and second annual reports. Public Health Service Publication No. 2039. Washington, U.S. Government Printing Office, 1970. p.65.

The cost estimates herein make no allowance for treatment of surface or subsurface runoff, or for income that might be derived from crops grown on the organics farm. It is not known at this time whether either would be a significant factor in the overall cost.

VI. SKI MOUNTAIN COSTS

A. TOTAL PROGRAM

Table VI-1 is a summary of the estimated initial capital requirements, annual costs, and unit costs for disposing of the total projected 1975 quantities of Cook County solid wastes through the Ski Mountain Plan as outlined in Section V.

Estimates were based on 1970 costs and include no allowances for increasing costs due to inflation, for taxes or payments in lieu of taxes, nor for potential revenue from salvage. These cost factors, which are undeterminable now, should be evaluated and considered in the final design and financing of the Ski Mountain Plan. Allowances for legal, engineering, and administrative expenses and interest during construction were included in estimates of capital requirements. Allowances of 5 per cent of annual costs were included for administration expenses. Allowances of six weeks of normal operating expenses were included for working capital. Annual fixed costs for the disposal facility were allocated to types of waste in accordance with space requirements in the mountain.

Dredgings were considered to be delivered by others in a form suitable for placement in the mountain. Costs shown for dredgings exclude transportation expense.

B. PROGRAM EXCLUDING ROCK

Table VI-2 shows the estimated costs of the Ski Mountain program based on handling the total projected 1975 quantites of Cook County solid waste excluding rock from the Deep Tunnel Project.

C. PROGRAM FOR 50 PER CENT OF REFUSE

Table VI-3 shows the estimated costs of the Ski Mountain program based on handling only 50 per cent of the projected 1975 quantities of Cook

Table VI-1

SUMMARY OF ESTIMATED COSTS****
FOR THE SKI MOUNTAIN
(Total Projected 1975 Quantities)

	Capital Required	Annual Cost	1975 Quantity	Unit Cost	
	$1,000	$1,000	1,000 tons	$/ton	
Residential, Commercial, and Industrial Refuse and Combustible Demolition Debris					
Receive and process	145,000	38,000		6.06	
Railroad transportation	18,500	10,650		1.70	
Disposal					
Organic	26,000	9,000	*	1.91	
Inorganic	2,900	330	**	0.21	
Subtotal	192,400	57,980		9.25	
Administration	5,400***	3,770		0.60	
Total	197,800	61,750	6,266		9.85
Rock					
Receive	9,600	2,400		0.12	
Barge transportation	23,600	16,700		0.84	
Disposal	28,200	3,100		0.15	
Subtotal	61,400	22,200		1.11	
Administration	2,100***	1,100		0.06	
Total	63,500	23,300	20,000		1.17
Ashes, Screenings and Sweepings					
Receive	8,600	800		0.94	
Barge transportation	3,200	900		1.06	
Disposal	1,600	180		0.21	
Subtotal	13,400	1,880		2.22	
Administration	95***	90		0.11	
Total	13,495	1,970	847		2.33
Dredgings and Other Inorganic Material					
Disposal only	700	75		0.21	
Administration	5***	5		0.02	
Total	705	80	352		0.23
TOTAL	275,500	87,100			
Recapitulation					
Capital improvements	267,900				
Working capital	7,600				
Amortization of capital investment		26,600	31%		
Operating expense		60,500	69%		
Total	275,500	87,100	100%		

* Organic material 4,700,000 ton.
** Inorganic material 1,566,000 ton.
*** Working capital.
**** No allowance for revenue from salvage.

Table VI-2

SUMMARY OF ESTIMATED COSTS**** FOR THE SKI MOUNTAIN EXCLUDING ROCK

(Total Projected 1975 Quantities Excluding Rock)

	Capital Required $1,000	Annual Cost $1,000	1975 Quantity 1,000 tons	Unit Cost $/ton	
Residential, Commercial, and Industrial Refuse and Combustible Demolition Debris					
Receive and process	145,000	38,000		6.06	
Railroad Transportation	18,500	10,650		1.70	
Disposal					
Organic	26,000	9,000	*	1.91	
Inorganic	18,000	1,800	**	1.15	
Subtotal	207,500	59,450		9.49	
Administration	5,380***	3,750		0.60	
Total	212,880	63,200	6,266		10.09
Ashes, Screenings and Sweepings					
Receive	8,600	800		0.94	
Transport by barges	3,200	900		1.06	
Disposal	9,700	950		1.13	
Subtotal	21,500	2,650		3.13	
Administration	110***	130		0.15	
Total	21,610	2,780	847		3.28
Dredgings and Other Inorganic Material					
Disposal only	4,000	400		1.14	
Administration	10***	20		0.05	
Total	4,010	420	352		1.19
TOTAL	238,500	66,400			
Recapitulation					
Capital improvements	233,000				
Working capital	5,500				
Amortization of capital investment		22,700	34%		
Operating expense		43,700	66%		
Total	238,500	66,400	100%		

* Organic material 4,700,000 ton.
** Inorganic material 1,566,000 ton.
*** Working capital.
**** No allowance for revenue from salvage.

Table VI-3

SUMMARY OF ESTIMATED COSTS**** FOR THE SKI MOUNTAIN BASED ON FIFTY PER CENT OF RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL REFUSE AND COMBUSTIBLE DEMOLITION DEBRIS

	Capital Required	Annual Cost	Fifty Per Cent of 1975 Quantity	Unit Cost
	$1,000	$1,000	1,000 tons	$/ton
Residential, Commercial, and Industrial Refuse and Combustible Demolition Debris				
Receive and process	72,500	19,000		6.06
Railroad transportation	9,400	5,350		1.70
Disposal				
Organic	25,500	5,400	*	2.30
Inorganic	31,600	3,000	**	3.83
Subtotal	139,000	32,750		10.45
Administration	3,000 ***	1,900		0.61
Total	142,000	34,650	3,133	11.06
Recapitulation				
Capital improvements	139,000			
Working capital required	3,000			
Amortization of capital investment		12,900	37%	
Operating expense		21,750	63%	
Total	142,000	34,650	100%	

* Organic material 2,350,000 ton.

** Inorganic material 783,000 ton.

*** Working capital.

**** No allowance for revenue from salvage.

County residential, commercial, and industrial refuse and combustible demolition debris.

D. SUMMARY

Capital requirements, annual costs and unit costs of the three programs are summarized in the following tabulation:

	All Cook County Solid Waste	All Cook County Solid Waste Excluding Rock	Fifty Per Cent of Cook County Residential, Commercial, and Industrial Refuse and Combustible Demolition Debris
	$	$	$
Capital Required			
Capital improvements	267,900,000	233,000,000	139,000,000
Working capital	7,600,000	5,500,000	3,000,000
Total	275,500,000	238,500,000	142,000,000
Annual Cost			
Amortization of capital investment	26,600,000	22,700,000	12,900,000
Operating expense	60,500,000	43,700,000	21,750,000
Total	87,100,000	66,400,000	34,650,000
Unit Cost ($ /ton)			
Residential, commercial, and industrial refuse	9.85	10.09	11.06
Rock	1.17	–	–
Ashes, screenings, and sweepings	2.33	3.28	–
Dredgings, disposal only	0.23	1.19	–

VII. ADMINISTRATION

Although originally service was envisaged only for Cook County, the service area of the proposed Ski Mountain facility need not be limited. With available methods of transportation, a large portion of the State of Illinois could be served. The large potential service area and location of the site outside the civil jurisdiction of the governmental agencies of Cook County indicate the need for a regional or State level agency to establish and operate the facility.

No agency is presently organized and empowered to manage a solid waste disposal system of the scope envisioned in the Ski Mountain project. A new agency will be required and special legislation will no doubt be needed to authorize it.

Initially, the function of the Ski Mountain agency will be construction of the mountain. This will involve such major activities as contracting with municipalities, counties, and private agencies to utilize the facilities; acquisition of land for the mountain, transfer stations, and organics farm; providing transportation systems for delivering materials to the mountain and organics farm; operation of transportation and disposal systems; and collecting sufficient revenue to finance all costs of the program.

As parts of the site or the mountain itself are turned over to temporary or permanent recreational use, the agency will take over the secondary function of managing a recreational facility. In time, when construction of the mountain is complete, the construction phase will reduce to a maintenance activity and recreation will become the primary function of the agency.

To function effectively, the management agency will require certain powers, including:

- The power of eminent domain to allow acquisition of property.
- Authority to contract on a long-term basis with municipalities, countries, districts, and other governmental agencies.
- Authority to enter into long-term contracts with private contractors, as may be necessary.
- Authority to pay for capital expenditures through debt financing.
- Authority to levy service charges to pay all or a part of capital and operating expenses.

VIII. FINANCING

A. CAPITAL REQUIREMENTS

1. **Capital Expenditures.** Financing of the Ski Mountain project will require that sufficient capital be obtained initially to pay for all land purchase, site development, transportation systems, other capital improvements, and organizational expenses, and to provide working capital.

As indicated by the cost summaries in Section VI, the capital required to establish the Ski Mountain system is influenced by the types and quantities of materials to be handled by the system. Capital requirements at 1970 costs, estimated at $27[illegible],500,000 for handling the total projected 1975 quantities of Cook County solid waste, are estimated to be only $142,000,000 for handling 50 per cent of the residential, commercial, and industrial refuse and combustible demolition debris.

Determination of the actual capital requirement will be possible only after a definite program has been formulated and the cost of facilities required for that program has been ascertained by detailed estimates.

2. **Sources of Capital Funds.** Potential sources of capital funds for establishing the Ski Mountain system include bonds issued by the Ski Mountain agency and grants from the State or Federal government. Both the Federal government, under the Resources Recovery Act of 1970, and the State of Illinois, under the Anti-Pollution Bond Act of 1970, have authorized grants-in-aid for improved solid waste disposal systems, but the availability of grants for the Ski Mountain system can be only conjectured at this time. Therefore, the figures which follow are based on financing all capital requirements through issuance of bonds, with no allowance for grants-in-aid.

General obligation and revenue bonds are both commonly used in municipal or local public agency financing of capital facilities. General obligation bonds are backed by the full faith and credit of the community and the security of the bonds is guaranteed by the ability of the public agency issuing them to assess and collect taxes.

Revenue bonds are repaid from revenues collected by the public agency for providing a service, and are not a lien on the property of the agency or the community. The agreed-upon bond interest and principal payments have priority on the revenues of the agency but this is the only security of this type of bond.

Because they represent a lien against property, general obligation bonds are usually considered more secure than revenue bonds of the same agency and therefore command a lower rate of interest. If the issuing agency is newly established, with little or no background of management capabilities and revenues to show, it may not find buyers for revenue bonds at an acceptable rate of interest.

The investor in revenue bonds must set up safeguards in the bond contract to insure that sufficient revenues will be available at all times to provide for bond interest and retirement. In marketing revenue bonds, it is customary to show that expected net revenues after operating expenses will exceed bond obligations by at least 40 to 50 per cent during the life of the bonds. Accumulation of reserve funds to cover fixed charges in the event of shortages in net revenue is also a usual requirement for a revenue bond agreement. Because of such requirements, an agency may find itself under severe limitations on the use of its revenue.

Because the Ski Mountain agency will be a new entity with no background of operations, revenues, or management capabilities, it is unlikely that the agency would be able to market revenue bonds on an acceptable basis. Therefore, general obligation bonds will be the most probable source of capital funds for establishing the agency. After the Ski Mountain agency is a going concern, it may find revenue bonds a practical means for meeting subsequent capital requirements.

B. ANNUAL REVENUE REQUIREMENTS

After the Ski Mountain project is established, revenues must be sufficient to meet the expenses of operating and maintaining the system, make principal and interest payments on bonds issued to finance the project, set aside any stipulated bond reserve funds, pay any taxes, and meet any other payments necessary to the operation.

As shown by the cost summary in Section VI, the annual cost of the project is dependent on the type and quantity of materials handled. Annual costs are shown to range from $87,100,000 for handling the total projected 1975 quantities of Cook County solid waste down to $34,650,000 for handling only 50 per cent of the residential, commercial, and industrial refuse and demolition debris.

C. MEETING REVENUE REQUIREMENTS

Three methods were considered for obtaining funds to meet the cost of solid waste disposal under the Ski Mountain system: general tax funds, direct charges to those using the service, and a combination of general tax funds and direct charges.

1. **General Tax Funds.** General tax fund financing has two principal advantages over other methods: simplicity and lower cost. Since no special billing and accounting is necessary, billing and collecting costs, as well as some overhead expenses, are avoided. Because all persons in the area served by the Ski Mountain facility would benefit from a cleaner environment resulting from a pollution-free solid waste disposal system, it is reasonable that all should help defray the cost of the facility. This could be accomplished through general tax fund financing.

The principal disadvantage of general fund financing is that the cost to the individual taxpayer might not be in proportion to the service received.

2. **Direct Charges.** A direct charge for each ton of material handled by the Ski Mountain project has the advantage of requiring those who use the facility to pay for its full cost. While a direct charge would result in a reasonably equitable distribution of cost, it does not recognize the general benefit of a cleaner environment that would accrue to the entire community because of the project.

Disadvantages of direct charges are that unit charges during the initial low volume operation might be high enough to discourage use, and the cost of billing and collecting would be added to the cost of service. However, this cost need not be excessive.

3. **Combination of General Tax Fund and Direct Charges.** Because the Ski Mountain would be available for use by all within its service area and because all would benefit from the cleaner environment the facility would

promote, it is reasonable that all should help defray its cost. On the other hand, it is also reasonable that those using the facility should pay a higher proportion of its cost than those who do not use it.

A practical means for achieving both objectives would be to amortize capital investment from general tax funds and to pay all operating costs from direct charges levied on solid wastes handled by the system. The relative proportions of amortization costs and operation costs are indicated in the cost summaries in Section VI. Under the combined method of financing, 31 to 37 per cent of the cost would be paid from general tax funds and the remainder from direct charges to those using the disposal system.

A possible advantage of this method of financing over direct charges might be greater use of the Ski Mountain system. Since everyone would share in its cost, there would be more incentive to utilize the facilities. Availability of tax funds would also be advantageous to help defray startup expenses and operating expenses during the early period of low-volume operation when charges for recovering all costs through direct charges might be high enough to discourage use of the facility.

The combined method would have the same disadvantage as the direct charge method in that the cost of billing and collecting would be added to the cost of the service.

4. **Recommended Method.** A combination of general tax funds and direct charges is recommended to provide revenue to finance the Ski Mountain system. Amortization of capital investment would be paid from general tax funds, and operating costs would be recovered through direct charges for each ton of solid waste received.

5. **Charges.** Charges for residential, commercial, and industrial refuse and other compressible materials should be based on weight. Charges for rock, ash and similar materials of uniform density could be based on either weight or volume.

Estimated unit costs for various types of solid wastes presented in Section VI are the approximate charges required to recover the full cost for disposing of these materials under the Ski Mountain system. Table VIII-1 shows the approximate charges required to fully recover the estimated cost, and charges required if capital investment were amortized with general tax funds.

Table VIII-1

APPROXIMATE CHARGES

	All Cook County Waste	All Cook County Waste Excluding Rock	Fifty Per Cent of Cook County Residential, Commercial, and Industrial Refuse and Combustible Demolition Debris
	$/ton	$/ton	$/ton
Charges to Recover Full Cost			
Residential, commercial, and industrial refuse	9.85	10.09	11.06
Rock	1.17	–	–
Ashes, screenings, and sweepings	2.33	3.28	–
Dredgings, disposal only	0.23	1.19	–
Charges to Recover Operating Expense Only			
Residential, commercial, and industrial refuse	6.76	6.81	6.95
Rock	0.87	–	–
Ash, screenings, and sweepings	0.86	1.10	–
Dredgings, disposal only	0.07	0.30	–

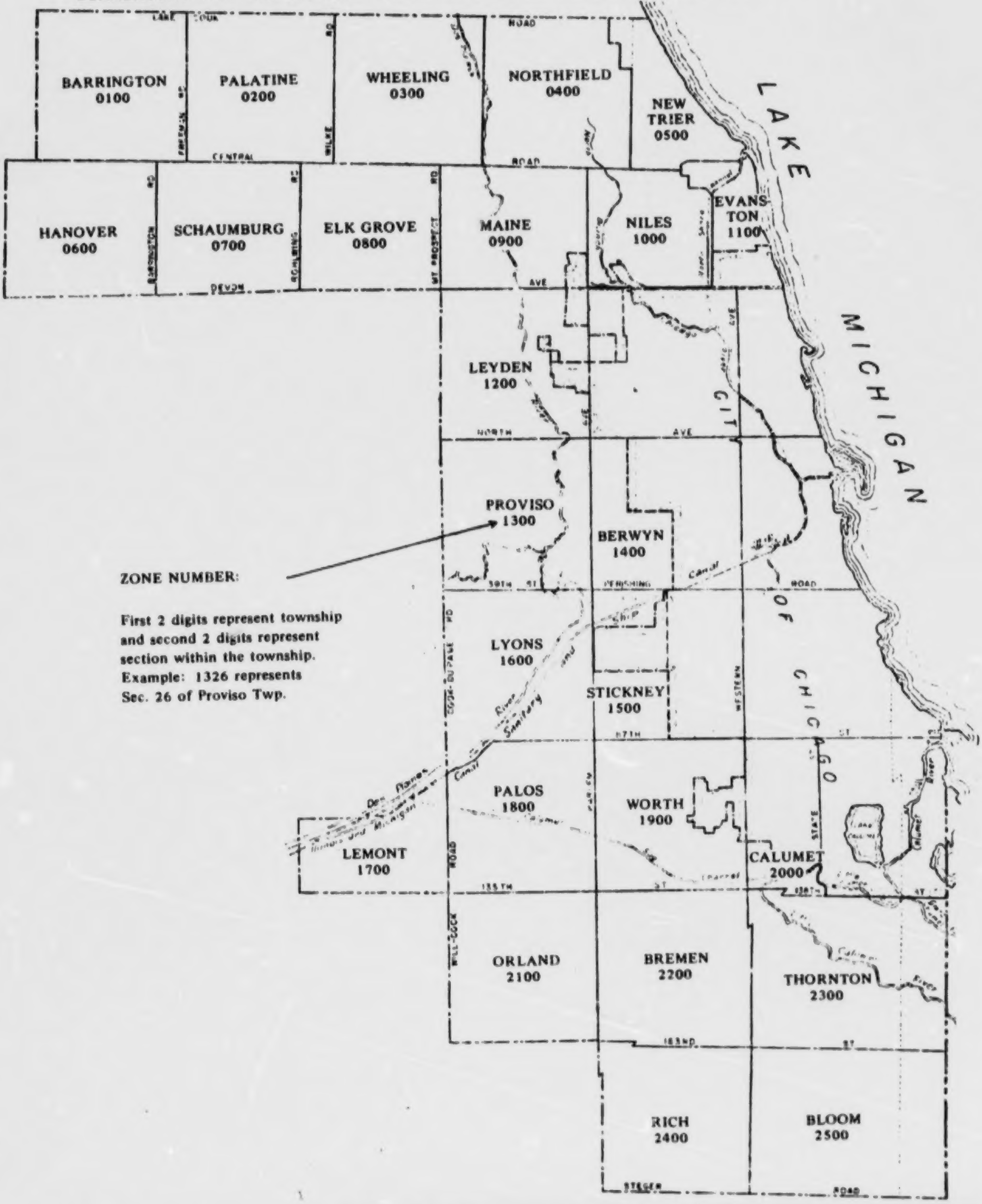
D. FINANCING OF RECREATION FACILITIES

Purchase of all land for both the solid waste disposal and recreation functions would be financed with general tax funds as previously discussed. Development of small lakes for ultimate recreational use would be financed as part of the disposal operations, since these impoundments would be used initially for controlling erosion, sediment and water pollution.

Skiing, camping, and other major recreational and ancillary facilities could be provided either by private concessionaires and financed through user charges, or such facilities could be provided by the public agency responsible for management of the Ski Mountain and financed by an appropriate combination of general tax funds and user charges.

APPENDIX A

PROJECTIONS BY TOWNSHIPS OF POPULATION AND RESIDENTIAL COMMERCIAL AND INDUSTRIAL SOLID WASTE FOR SUBURBAN COOK COUNTY


BARRINGTON 0100
PALATINE 0200
WHEELING 0300
NORTHFIELD 0400
NEW TRIER 0500
HANOVER 0600
SCHAUMBURG 0700
ELK GROVE 0800
MAINE 0900
NILES 1000
EVANSTON 1100
LEYDEN 1200
PROVISO 1300
BERWYN 1400
STICKNEY 1500
LYONS 1600
LEMONT 1700
PALOS 1800
WORTH 1900
CALUMET 2000
ORLAND 2100
BREMEN 2200
THORNTON 2300
RICH 2400
BLOOM 2500
LAKE MICHIGAN
CITY OF CHICAGO
CENTRAL ROAD
DEVON AVE
NORTH AVE
PERSHING ROAD
87TH ST
135TH ST
163RD ST
STEGER ROAD
COOK-DU PAGE RD
WILL-COOK ROAD
Sanitary and Ship Canal
Des Plaines River
Illinois and Michigan Canal

ZONE NUMBER:

First 2 digits represent township and second 2 digits represent section within the township. Example: 1326 represents Sec. 26 of Proviso Twp.

SUBURBAN COOK COUNTY - TOWNSHIP INDEX

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

BARRINGTON

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0101									33	64	85	123	297	691	1071	1771
0102		75	75	75		4050	4725	5400	3	18	26	58	27	194	328	835
0103											9	18			113	259
0104										6	6	13		65	76	187
0105																
0106																
0107																
0108																
0109										1	1	1		11	13	14
0110												11				158
0111											7	21			88	302
0112		67	67	67		3618	4221	4824				29				418
0113																
0114																
0115		25	25	25		1350	1575	1800		1	1	1		11	13	14
0116		25	25	25		1350	1575	1800		6	7	9		65	88	130
0117										1	1	1		11	13	14
0118																
0119																
0120																
0121		10	10	10		540	630	720		4	5	7		43	63	101
0122		10	10	10		540	630	720		6	6	9		65	76	130
0123											3	7			38	101
0124																
0125																
0126											1	2			13	29
0127											3	7			38	101
0128																
0129																
0130																
0131																
0132																
0133												2				29
0134												1				14
0135												1				14
0136									4	4	4	5	36	43	50	72
		212	212	212		11448	13356	15264	40	111	165	326	360	1199	2081	4693

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

BARRINGTON

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0101	4300	5300	6300	7900	1625	2406	3364	4851	1922	3097	4435	6622
0102	547	547	1147	3160	207	248	612	1940	234	4492	5665	8175
0103	148	148	748	1310	56	67	399	804	56	67	512	1063
0104	215	535	535	535	81	243	286	328	81	308	362	515
0105	27	127	127	127	10	58	68	78	10	58	68	78
0106	59	59	59	59	22	27	32	36	22	27	32	36
0107	47	47	47	47	18	21	25	29	18	21	25	29
0108												
0109	47	247	247	247	18	112	132	152	18	123	145	166
0110	156	156	156	794	59	71	83	488	59	71	83	646
0111	176	176	776	1138	67	80	414	699	67	80	502	1001
0112	211	211	211	2136	80	96	113	1312	80	3714	4334	6554
0113	62	62	62	62	23	28	33	38	23	28	33	38
0114												
0115	78	228	228	228	29	104	122	140	29	1465	1710	1954
0116	86	586	586	586	33	266	313	360	33	1681	1976	2290
0117	35	185	185	185	13	84	99	114	13	95	112	128
0118	27	27	27	27	10	12	14	17	10	12	14	17
0119	62	62	62	62	23	28	33	38	23	28	33	38
0120	59	89	89	89	22	40	48	55	22	40	48	55
0121	70	470	470	470	26	213	251	289	26	796	944	1110
0122	20	500	500	500	8	227	267	307	8	832	973	1157
0123	31	51	251	251	12	23	134	154	12	23	172	255
0124	23	23	23	23	9	10	12	14	9	10	12	14
0125	23	23	23	33	9	10	12	20	9	10	12	20
0126	27	27	127	187	10	12	68	115	10	12	81	144
0127	31	81	281	281	12	37	150	173	12	37	188	274
0128	27	27	27	27	10	12	14	17	10	12	14	17
0129	8	8	8	8	3	4	4	5	3	4	4	5
0130	23	23	23	23	9	10	12	14	9	10	12	14
0131	20	20	20	20	8	9	11	12	8	9	11	12
0132	39	39	39	39	15	18	21	24	15	18	21	24
0133	27	27	27	227	10	12	14	139	10	12	14	168
0134	31	31	31	231	12	14	17	142	12	14	17	156
0135	27	27	27	287	10	12	14	176	10	12	14	190
0136	31	31	31	301	12	14	17	185	48	57	67	257
	6800	10200	13500	21600	2571	4628	7208	13265	2931	17275	22645	33222

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

PALATINE

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0201									3	3	13	45	27	32	164	648
0202									8	9	24	46	72	97	302	662
0203									12	12	12	12	108	130	151	173
0204									8	8	8	8	72	86	101	115
0205									3	3	3	3	27	32	38	43
0206									3	4	11	31	27	43	139	446
0207									2	2	7	12	18	22	88	173
0208									2	2	23	49	18	22	290	706
0209	3	3	3	3	135	162	189	216	13	13	34	53	117	140	428	763
0210	5	5	5	5	225	270	315	360	25	25	56	61	225	270	706	878
0211	3	3	3	3	135	162	189	216	16	47	59	69	144	508	743	994
0212									8	20	49	64	72	216	617	922
0213									11	13	23	38	99	140	290	547
0214	5	5	5	5	225	270	315	360	24	25	41	56	216	270	517	806
0215	10	10	10	10	450	540	630	720	36	36	46	57	324	389	580	821
0216	5	5	5	5	225	270	315	360	19	19	44	60	171	205	554	864
0217											6	16			76	230
0218											6	6			76	86
0219										1	8	34		11	101	490
0220										1	22	32		11	277	461
0221	4	4	4	4	180	216	252	288	13	14	22	24	117	151	277	346
0222	9	9	9	9	405	486	567	648	24	32	41	56	216	346	517	806
0223	4	9	26	33	180	486	1638	2376	26	51	52	52	234	551	655	749
0224		6	16	26		324	1008	1872	28	58	103	118	252	626	1298	1699
0225									43	53	68	69	387	572	857	994
0226	4	4	4	4	180	216	252	288	28	29	79	90	252	313	995	1296
0227	8	8	8	8	360	432	504	576	13	24	37	47	117	259	466	677
0228	4	4	4	4	180	216	252	288	7	8	17	36	63	86	214	518
0229											27	52			340	749
0230											7	34			88	490
0231									7	7	7	7	63	76	88	101
0232									11	11	11	11	99	119	139	158
0233	5	5	5	5	225	270	315	360	19	19	40	157	171	205	504	2261
0234	12	12	12	12	540	648	756	864	26	26	38	73	234	281	479	1051
0235	6	6	6	6	270	324	378	432	32	47	67	67	288	508	844	965
0236	2	2	2	2	90	108	126	144	39	49	49	49	351	529	617	706
	89	100	127	144	4005	5400	8001	10368	509	671	1160	1694	4581	7246	14616	24394

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

PALATINE

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0201	350	350	450	7950	132	159	240	4881	159	191	404	5529
0202	441	641	741	3241	167	291	396	1990	239	388	698	2652
0203	700	700	800	800	265	318	427	491	373	448	578	664
0204	70	70	70	70	26	32	37	43	98	118	138	158
0205	91	91	91	91	34	41	49	56	61	73	87	99
0206	357	557	3157	3257	135	253	1686	2000	162	296	1825	2446
0207	21	21	1771	1771	8	10	946	1087	26	32	1034	1260
0208	336	336	561	661	127	153	300	406	145	175	590	1112
0209	287	287	587	5587	108	130	313	3430	360	432	930	4409
0210	413	413	2488	2488	156	188	1329	1528	606	728	2350	2766
0211	350	6150	6750	6750	132	2792	3605	4145	411	3462	4537	5355
0212	112	612	5612	5612	42	278	2997	3446	114	494	3614	4368
0213	4711	5191	5191	5191	1781	2357	2772	3187	1880	2497	3062	3734
0214	4869	5389	5789	5789	1840	2447	3091	3554	2281	2987	3923	4720
0215	5120	5120	5370	5770	1935	2324	2868	3543	2709	3253	4078	5084
0216	448	448	5498	5998	169	203	2936	3683	565	678	3805	4907
0217	952	1152	1252	1252	360	523	669	769	360	523	745	999
0218	161	161	161	161	61	73	86	99	61	73	162	185
0219	119	369	2869	7869	45	168	1532	4832	45	179	1633	5322
0220	385	635	8035	8135	146	288	4291	4995	146	299	4568	5456
0221	458	558	3658	4158	173	253	1953	2553	470	620	2482	3187
0222	3846	3846	4146	4246	1454	1746	2214	2607	2075	2578	3298	4061
0223	2700	2900	3300	3300	1021	1317	1762	2026	1435	2354	4055	5151
0224	434	434	1034	1034	164	197	552	635	416	1147	2858	4206
0225	3801	3801	3801	4401	1437	1726	2030	2702	1824	2298	2887	3696
0226	1701	2001	2001	2601	643	908	1069	1597	1075	1437	2316	3181
0227	469	3019	4119	4119	177	1371	2200	2529	654	2062	3170	3782
0228	49	299	1679	6679	19	136	897	4101	262	438	1363	4907
0229	60	60	5930	6130	23	27	3167	3764	23	27	3507	4513
0230	35	35	535	3035	13	16	286	1863	13	16	374	2353
0231	24	24	24	24	9	11	13	15	72	87	101	116
0232	150	150	150	150	57	68	80	92	156	187	219	250
0233	35	35	485	3485	13	16	259	2140	409	491	1078	4761
0234	283	483	933	2933	107	219	498	1801	881	1148	1733	3716
0235	2037	2137	2137	2137	770	970	1141	1312	1328	1802	2363	2709
0236	6125	6125	6125	6125	2315	2781	3271	3761	2756	3418	4014	4611
	42500	54600	97300	133000	16064	24790	51962	81663	24650	37436	74579	116425

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

WHEELING

ZONE	INDUSTRIAL LAND USE ACRE 1965	1975	1985	1995	INDUSTRIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	COMMERCIAL LAND USE ACRE 1965	1975	1985	1995	COMMERCIAL REFUSE TONS PER YEAR 1965	1975	1985	1995
0301	9	9	9	9	405	486	567	648	11	20	20	20	99	216	252	288
0302	8	8	8	8	360	432	504	576	10	43	53	53	90	464	668	763
0303	8	8	8	8	360	432	504	576	10	20	30	35	90	216	378	504
0304	4	4	4	4	180	216	252	288	8	13	25	30	72	140	315	432
0305									7	7	17	24	63	76	214	346
0306									5	5	5	5	45	54	63	72
0307									6	6	20	31	54	65	252	446
0308									11	11	23	104	99	119	290	1498
0309	7	7	7	7	315	378	441	504	10	18	29	34	90	194	365	490
0310	14	14	14	14	630	756	882	1008	17	17	22	27	153	184	277	389
0311	9	44	44	44	405	2376	2772	3168	12	43	53	55	108	464	668	792
0312	5	5	5	5	225	270	315	360	11	41	51	51	99	443	643	734
0313									12	19	25	31	108	205	315	446
0314	10	80	80	80	450	4320	5040	5760	16	29	35	41	144	313	441	590
0315	20	20	20	20	900	1080	1260	1440	20	30	39	47	180	324	491	677
0316	10	10	10	10	450	540	630	720	12	13	30	42	108	140	378	605
0317									4	12	136	143	36	130	1714	2059
0318									8	9	23	33	72	97	290	475
0319	1	1	1	1	45	54	63	72	37	37	39	39	333	400	491	562
0320	2	2	2	2	90	108	126	144	46	52	64	78	414	562	806	1123
0321	6	6	6	6	270	324	378	432	36	37	63	76	324	400	794	1094
0322	10	10	10	10	450	540	630	720	24	29	34	34	216	313	428	490
0323	5	75	75	75	225	4050	4725	5400	18	37	43	49	162	400	542	706
0324									11	19	25	31	99	205	315	446
0325									10	24	39	39	90	259	491	562
0326									19	27	38	43	171	292	479	619
0327									29	40	42	42	261	432	529	605
0328	2	2	2	2	90	108	126	144	60	71	76	76	540	767	958	1094
0329	3	3	3	3	135	162	189	216	90	90	94	96	810	972	1184	1382
0330	2	2	2	2	90	108	126	144	66	76	81	82	594	821	1021	1181
0331	2	2	2	2	90	108	126	144	45	48	54	57	405	518	680	821
0332	3	3	3	3	135	162	189	216	50	54	58	64	450	583	731	922
0333	3	42	42	42	135	2268	2646	3024	49	72	74	77	441	778	932	1109
0334	2	2	2	2	90	108	126	144	47	47	47	47	423	508	592	677
0335	11	17	17	17	495	918	1071	1224	33	74	81	86	297	799	1021	1238
0336	11	11	11	11	495	594	693	792	19	37	42	47	171	400	529	677
	167	387	387	387	7515	20898	24381	27864	879	1227	1630	1869	7911	13253	20537	26914

WHEELING

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ZONE	POPULATION 1965	1975	1985	1995	RESIDENTIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	TOTAL REFUSE TONS PER YEAR 1965	1975	1985	1995
0301	73	73	73	73	28	33	39	45	532	735	858	981
0302	3852	5402	5402	5402	1456	2453	2885	3317	1906	3349	4057	4656
0303	3350	3350	3350	3350	1266	1521	1789	2057	1716	2169	2671	3137
0304	1350	1350	1975	1975	510	613	1055	1213	762	969	1622	1933
0305	1334	1334	1959	1959	504	606	1046	1203	567	682	1260	1549
0306	40	40	40	40	15	18	21	25	60	72	84	97
0307	16	116	1366	1866	6	53	729	1146	60	118	981	1592
0308	258	258	1070	1570	98	117	571	964	197	236	861	2462
0309	875	1675	2113	2113	331	760	1128	1297	736	1332	1934	2291
0310	4232	4382	4382	4382	1600	1989	2340	2691	2383	2929	3499	4088
0311	2176	2961	2961	2961	823	1344	1581	1818	1336	4184	5021	5778
0312	173	526	526	526	65	239	281	323	389	952	1239	1417
0313	32	344	344	344	12	156	184	211	120	361	499	657
0314	206	2706	2706	2706	78	1229	1445	1661	672	5862	6926	8011
0315	1612	2617	2617	2617	609	1188	1397	1607	1689	2592	3148	3724
0316	625	1188	2438	2438	236	539	1302	1497	794	1219	2310	2822
0317	762	962	8712	8712	288	437	4652	5349	324	567	6366	7408
0318	1213	1413	2663	2663	459	642	1422	1635	531	739	1712	2110
0319	4590	4590	5190	5190	1735	2084	2771	3187	2113	2538	3325	3821
0320	3855	4055	5055	6255	1457	1841	2699	3841	1961	2511	3631	5108
0321	1052	1314	6314	6314	398	597	3372	3877	992	1321	4544	5403
0322	3023	3143	3143	3143	1143	1427	1678	1930	1809	2280	2736	3140
0323	624	5424	5424	5424	236	2462	2896	3330	623	6912	8163	9436
0324	375	1075	1075	1075	142	488	574	660	241	693	889	1106
0325	1765	3215	3215	3215	667	1460	1717	1974	757	1719	2208	2536
0326	2257	4757	5357	5357	853	2160	2861	3289	1024	2452	3340	3908
0327	4612	4912	4912	4912	1743	2230	2623	3016	2004	2662	3152	3621
0328	3305	3505	3505	3505	1249	1591	1872	2152	1879	2466	2956	3390
0329	5905	5905	5905	5905	2232	2681	3153	3626	3177	3815	4526	5224
0330	6989	6989	6989	7389	2642	3173	3732	4537	3326	4102	4879	5862
0331	6344	6344	6344	6344	2398	2880	3388	3895	2893	3506	4194	4860
0332	5036	5036	5036	6436	1904	2286	2689	3952	2489	3031	3609	5090
0333	4454	4654	4654	4654	1684	2113	2485	2858	2260	5159	6063	6991
0334	9238	9238	9238	9238	3492	4194	4933	5672	4005	4810	5651	6493
0335	1191	3091	3891	3891	450	1403	2078	2389	1242	3120	4170	4851
0336	806	7056	7056	7056	305	3203	3768	4332	971	4197	4990	5801
	87600	115000	137000	141000	33114	52210	73156	86576	48540	86361	118074	141354

NORTHFIELD

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0401																
0402	7	55	103	151	315	2970	6489	10872	13	29	59	77	117	313	743	1109
0403	3	25	47	69	135	1350	2961	4968	13	19	41	56	117	205	517	806
0404	36	128	220	312	1620	6912	13860	22464	10	16	47	78	90	173	592	1123
0405		21	42	63		1134	2646	4536	8	28	48	63	72	302	605	907
0406									9	35	74	89	81	378	932	1282
0407									9	39	89	89	81	421	1121	1282
0408									8	15	15	15	72	162	189	216
0409	1	2	3	4	45	108	189	288	31	32	35	35	279	346	441	504
0410									56	59	60	60	504	637	756	864
0411	14	32	50	68	630	1728	3150	4896	38	38	39	39	342	410	491	562
0412	31	85	139	193	1395	4590	8757	13896	20	20	20	20	180	216	252	288
0413	14	38	62	86	630	2052	3906	6192	27	39	50	50	243	421	630	720
0414									63	63	63	67	567	680	794	965
0415	40	108	176	244	1800	5832	11088	17568	100	100	100	100	900	1080	1260	1440
0416									53	60	61	61	477	648	769	878
0417									6	7	23	33	54	76	290	475
0418		23	46	69		1242	2898	4968	9	9	10	20	81	97	126	288
0419	3	104	205	306	135	5616	12915	22032	11	11	11	21	99	119	139	302
0420		139	278	417		7506	17514	30024	10	16	18	28	90	173	227	403
0421									82	101	101	161	738	1091	1273	2318
0422	5	18	31	44	225	972	1953	3168	155	172	174	175	1395	1858	2192	2520
0423									91	131	181	211	819	1415	2281	3038
0424	10	28	46	64	450	1512	2898	4608	28	28	28	28	252	302	353	403
0425									29	33	33	36	261	356	416	518
0426									117	152	162	172	1053	1642	2041	2477
0427	21	50	79	108	945	2700	4977	7776	208	208	208	208	1872	2246	2621	2995
0428	30	90	150	210	1350	4860	9450	15120	112	117	131	131	1008	1264	1651	1886
0429									14	19	35	35	126	205	441	504
0430									12	12	32	66	108	130	403	950
0431									16	16	16	16	144	173	202	230
0432		77	154	231		4158	9702	16632	15	55	95	137	135	594	1197	1973
0433									82	82	82	83	738	886	1033	1195
0434									149	157	167	167	1341	1696	2104	2405
0435	9	18	27	36	405	972	1701	2592	87	87	87	87	783	940	1096	1253
0436									26	44	53	62	234	475	668	893
	224	1041	1858	2675	10080	56214	117054	192600	1717	2049	2448	2776	15453	22130	30846	39972

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

NORTHFIELD

ZONE	POPULATION 1965	1975	1985	1995	RESIDENTIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	TOTAL REFUSE TONS PER YEAR 1965	1975	1985	1995
0401												
0402	109	109	109	109	41	49	58	67	473	3332	7290	12048
0403	599	3099	3899	3899	226	1407	2082	2394	478	2962	5560	8168
0404	613	3113	3413	3713	232	1413	1823	2280	1942	8498	16275	25867
0405	924	924	4674	6374	349	419	2496	3914	421	1855	5747	9357
0406	308	2808	4058	4058	116	1275	2167	2492	197	1653	3099	3774
0407	865	865	8365	8365	327	393	4467	5136	408	814	5588	6418
0408	819	3319	3519	3519	310	1507	1879	2161	382	1669	2068	2377
0409	4165	4365	5565	5565	1574	1982	2972	3417	1898	2436	3602	4209
0410	3611	4911	5311	5311	1365	2230	2836	3261	1869	2867	3592	4125
0411	1470	1670	1770	1770	556	758	945	1087	1528	2896	4586	6545
0412	413	413	413	413	156	188	221	254	1731	4994	9230	14438
0413	963	963	1363	1363	364	437	728	837	1237	2910	5264	7749
0414	287	387	487	1737	108	176	260	1067	675	856	1054	2032
0415	46	46	46	146	17	21	25	90	2717	6933	12373	19098
0416	1890	4490	4990	4990	714	2038	2665	3064	1191	2686	3434	3942
0417	1414	2039	7839	7939	534	926	4186	4875	588	1002	4476	5350
0418	143	143	243	243	54	65	130	149	135	1404	3154	5405
0419	455	455	455	455	172	207	243	279	406	5942	13297	22613
0420	304	2804	3304	3304	115	1273	1764	2029	205	8952	19505	32456
0421	80	6955	6955	6955	30	3158	3714	4270	768	4249	4987	6588
0422	35	5035	5035	5035	13	2286	2689	3091	1633	5116	6834	8779
0423	1358	1358	1358	2708	513	617	725	1663	1332	2032	3006	4701
0424	3825	3825	3925	3925	1446	1737	2096	2410	2148	3551	5347	7421
0425	2523	2523	2723	3123	954	1145	1454	1918	1215	1501	1870	2436
0426	1954	1954	1954	2154	739	887	1043	1323	1792	2529	3084	3800
0427	46	46	46	46	17	21	25	28	2834	4967	7623	10799
0428	2743	2743	7943	7943	1037	1245	4242	4877	3395	7369	15343	21883
0429	231	231	631	631	87	105	337	387	213	310	778	891
0430	1411	1411	1411	6911	533	641	753	4243	641	771	1156	5193
0431									144	173	202	230
0432	620	620	820	1520	234	281	438	933	369	5033	11337	19538
0433	3619	3619	3919	4119	1368	1643	2093	2529	2106	2529	3126	3724
0434	3658	3658	3658	3706	1383	1561	1953	2277	2724	3357	4057	4682
0435	10084	10084	10084	10234	3812	4578	5385	6284	5000	6490	8182	10129
0436	1715	1715	1715	1715	648	779	916	1053	882	1254	1564	1946
	53300	82700	112000	124000	20144	37548	59810	76139	45677	115892	207710	308711

NEW TRIER

ZONE	INDUSTRIAL LAND USE ACRE 1965	1975	1985	1995	INDUSTRIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	COMMERCIAL LAND USE ACRE 1965	1975	1985	1995	COMMERCIAL REFUSE TONS PER YEAR 1965	1975	1985	1995
0505																
0506									8	8	8	8	72	86	101	115
0507									16	16	16	16	144	173	202	230
0508									6	6	6	6	54	65	76	86
0516																
0517									21	21	21	21	189	227	265	302
0518									24	24	24	24	216	259	302	346
0519	4	48	92	136	180	2592	5796	9792	33	33	33	33	297	356	416	475
0520									40	40	40	40	360	432	504	576
0521									23	23	23	23	207	248	290	331
0522																
0526																
0527									13	13	13	13	117	140	164	187
0528									46	46	46	46	414	497	580	662
0529									57	57	57	57	513	616	718	821
0530	7	43	79	115	315	2322	4977	8280	42	52	61	61	378	562	769	878
0531	8	28	48	68	360	1512	3024	4896	42	42	57	67	378	454	718	965
0532									58	70	70	70	522	756	882	1008
0533									54	54	54	54	486	583	680	778
0534									60	60	60	60	540	648	756	864
0535									34	34	34	34	306	367	428	490
0501									6	6	6	6	54	65	76	86
0502																
	19	119	219	319	855	6426	13797	22968	583	605	629	639	5247	6534	7927	9200

NEW TRIER

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0505	119	119	119	119	45	54	64	73	45	54	64	73
0506	2214	2214	2214	2214	837	1005	1182	1359	909	1091	1283	1474
0507	3117	3117	3117	3117	1178	1415	1664	1914	1322	1588	1866	2144
0508	1133	1133	1133	1133	428	514	605	696	482	579	681	782
0516	383	383	383	383	145	174	205	235	145	174	205	235
0517	3251	3251	3251	3251	1229	1476	1736	1996	1418	1703	2001	2298
0518	2987	2987	2987	2987	1129	1356	1595	1834	1345	1615	1897	2180
0519	2696	2696	2696	2696	1019	1224	1440	1655	1496	4172	7652	11922
0520	6213	6213	6213	6213	2349	2821	3318	3815	2709	3253	3822	4391
0521	2715	2715	2715	2715	1026	1233	1450	1667	1233	1481	1740	1998
0522	168	168	168	168	64	76	90	103	64	76	90	103
0526	1447	1447	1447	1447	547	657	773	888	547	657	773	888
0527	8613	8613	8613	8613	3256	3910	4599	5288	3373	4050	4763	5475
0528	3387	3387	3387	3387	1280	1538	1809	2080	1694	2035	2389	2742
0529	2507	2507	2507	2507	948	1138	1339	1539	1461	1754	2057	2360
0530	1119	1119	1119	1119	423	508	598	687	1116	3392	6344	9845
0531	5658	5658	5658	5658	2139	2569	3021	3474	2877	4535	6763	9335
0532	6341	6341	6341	6341	2397	2879	3386	3893	2919	3635	4268	4901
0533	2824	2824	2824	2824	1067	1282	1508	1734	1553	1865	2188	2512
0534	3730	3730	3730	3730	1410	1693	1992	2290	1950	2341	2748	3154
0535	4252	4252	4252	4252	1607	1930	2271	2611	1913	2297	2699	3101
0501	537	537	537	537	203	244	287	330	257	309	363	416
0502	589	589	589	589	223	267	315	362	223	267	315	362
	66000	66000	66000	66000	24949	29963	35247	40523	31051	42923	56971	72691

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0601																
0602																
0603																
0604																
0605												32				461
0606									11	15	34	41	99	162	428	590
0607	33	66	99	132	1485	3564	6237	9504	13	39	64	79	117	421	806	1138
0608											1	98			13	1411
0609												15				216
0610																
0611																
0612																
0613																
0614												1				14
0615																
0616																
0617											1	8			13	115
0618										6	60	69		65	756	994
0619	8	16	24	32	360	864	1512	2304	30	37	42	49	270	400	529	706
0620	10	40	79	118	450	2160	4977	8496			13	31			164	446
0621																
0622									3	5	31	35	27	54	391	504
0623									41	50	62	81	369	540	781	1166
0624											8	97			101	1397
0625										17	41	52		184	517	749
0626									11	28	32	36	99	302	403	518
0627											56	64			706	922
0628																
0629		25	60	95		1350	3780	6840				32				461
0630																
0631																
0632																
0633												2				29
0634										4	7	11		43	88	158
0635	30	65	100	135	1350	3510	6300	9720	1	9	13	26	9	97	164	374
0636									34	44	52	62	306	475	655	893
	81	212	362	512	3645	11448	22806	36864	144	254	517	921	1296	2743	6515	13262

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

HANOVER

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0601	12	12	12	12	5	5	6	7	5	5	6	7
0602	12	12	12	12	5	5	6	7	5	5	6	7
0603	12	12	12	12	5	5	6	7	5	5	6	7
0604	8	8	8	8	3	4	4	5	3	4	4	5
0605	4	4	4	2604	2	2	2	1599	2	2	2	2060
0606	1472	1572	3239	3439	556	714	1730	2112	655	876	2158	2702
0607	1850	4450	6183	6583	699	2020	3302	4042	2301	6005	10345	14684
0608	103	103	203	8103	39	47	108	4975	39	47	121	6386
0609	12	12	12	1262	5	5	6	775	5	5	6	991
0610	34	34	34	34	13	15	18	21	13	15	18	21
0611	19	19	19	19	7	9	10	12	7	9	10	12
0612	34	34	34	34	13	15	18	21	13	15	18	21
0613	26	26	26	26	10	12	14	16	10	12	14	16
0614	36	136	136	136	14	62	73	84	14	62	73	98
0615	43	43	43	43	16	20	23	26	16	20	23	26
0616	40	40	40	40	15	18	21	25	15	18	21	25
0617	159	159	159	659	60	72	85	405	60	72	98	520
0618	349	649	5649	5649	132	295	3017	3468	132	360	3773	4462
0619	3982	4082	4082	4082	1505	1853	2180	2506	2135	3117	4221	5516
0620	54	54	1304	2554	20	25	696	1568	470	2185	5837	10510
0621	75	75	75	75	28	34	40	46	28	34	40	46
0622	561	661	3011	3011	212	300	1608	1849	239	354	1999	2353
0623	5368	5468	5818	6585	2029	2482	3107	4043	2398	3022	3888	5209
0624	15	15	815	7931	6	7	435	4870	6	7	536	6267
0625	306	1889	3889	4306	116	858	2077	2644	116	1042	2594	3393
0626	1471	3088	3088	3088	556	1402	1649	1896	655	1704	2052	2414
0627	274	274	5274	5274	104	124	2816	3238	104	124	3522	4160
0628	47	47	47	47	18	21	25	29	18	21	25	29
0629	34	34	34	2534	13	15	18	1556	13	1365	3798	8857
0630	12	12	12	12	5	5	6	7	5	5	6	7
0631	12	12	12	12	5	5	6	7	5	5	6	7
0632	19	19	19	19	7	9	10	12	7	9	10	12
0633	75	75	75	175	28	34	40	107	28	34	40	136
0634	475	775	975	1175	180	352	521	721	180	395	609	879
0635	806	1006	1256	1656	305	457	671	1017	1664	4064	7135	11111
0636	4389	4689	4889	5089	1659	2129	2611	3125	1965	2604	3266	4018
	22200	29600	50500	76300	8395	13437	26965	46848	13336	27628	56286	96974

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

SCHAUMBERG

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0701	6	12	18	24	270	648	1134	1728								
0702																
0703																
0704																
0705																
0706																
0707												1				14
0708									30	50	90	151	270	540	1134	2174
0709									28	28	43	59	252	302	542	850
0710			8	16			504	1152	28	38	46	58	252	410	605	835
0711	26	164	312	460	1170	8856	19656	33120	25	35	50	70	225	378	630	1008
0712		56	122	188		3024	7686	13536	25	38	68	108	225	410	857	1555
0713									28	148	298	508	252	1598	3755	7315
0714			8	19			504	1368	28	28	88	88	252	302	1109	1267
0715									14	24	39	77	126	259	491	1109
0716									14	25	45	75	126	270	567	1080
0717									2	2	2	4	18	22	25	58
0718									2	2	2	4	18	22	25	58
0719									4	4	4	8	36	43	50	115
0720									4	4	4	16	36	43	50	230
0721										8	8	12		86	101	173
0722										3	3	3		32	38	43
0723									5	8	8	8	45	86	101	115
0724									5	5	5	5	45	54	63	72
0725									16	16	20	41	144	173	252	590
0726									5	5	11	11	45	54	139	158
0727	6	12	18	24	270	648	1134	1728	2	2	13	13	18	22	164	187
0728									2	2	2	22	18	22	25	317
0729									2	2	16	25	18	22	202	360
0730									2	8	22	22	18	86	277	317
0731										5	9	9		54	113	130
0732										1	3	8		11	38	115
0733		62	134	206		3348	8442	14832	2	2	40	150	18	22	504	2160
0734									2	2	4	13	18	22	50	187
0735											2	23			25	331
0736											4	30			50	432
	38	306	620	937	1710	16524	39060	67464	275	495	951	1622	2475	5345	11982	23355

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

SCHAUMBERG

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0701	158	158	158	158	60	72	84	97	330	720	1218	1825
0702	4	4	4	4	2	2	2	2	2	2	2	2
0703	71	71	71	71	27	32	38	44	27	32	38	44
0704	420	420	420	420	159	191	224	258	159	191	224	258
0705	8	8	8	8	3	4	4	5	3	4	4	5
0706	4	4	4	4	2	2	2	2	2	2	2	2
0707	25	25	25	345	9	11	13	212	9	11	13	226
0708	8	8	8	488	3	4	4	300	273	544	1138	2474
0709	2595	2595	2595	2795	981	1178	1386	1716	1233	1480	1928	2566
0710	921	921	921	921	348	418	492	565	600	828	1601	2552
0711	16	16	16	16	6	7	9	10	1401	9241	20295	34138
0712	8	8	8	8	3	4	4	5	228	3438	8547	15096
0713	347	347	347	347	131	158	185	213	383	1756	3940	7528
0714	1544	1544	1544	1544	584	701	824	948	836	1003	2437	3583
0715	3090	3290	3290	3290	1168	1494	1757	2020	1294	1753	2248	3129
0716	3173	3573	3573	3673	1199	1622	1908	2255	1325	1892	2475	3335
0717	16	16	16	728	6	7	9	447	24	29	34	505
0718	16	16	16	554	6	7	9	340	24	29	34	398
0719	12	12	12	1400	5	5	6	860	41	48	56	975
0720	2822	2822	2822	6884	1067	1281	1507	4227	1103	1324	1557	4457
0721	1752	4627	4627	6127	662	2101	2471	3762	662	2187	2572	3935
0722	781	1781	1781	1781	295	809	951	1094	295	841	989	1137
0723	78	1203	1203	1203	29	546	642	739	74	632	743	854
0724	29	29	29	29	11	13	15	18	56	67	78	90
0725	29	29	1279	1279	11	13	683	785	155	186	935	1375
0726	25	25	2275	2275	9	11	1215	1397	54	65	1354	1555
0727	45	45	3920	3920	17	20	2093	2407	305	690	3391	4322
0728	21	21	146	7146	8	10	78	4388	26	32	103	4705
0729	1121	1121	6121	9121	424	509	3269	5600	442	531	3471	5960
0730	45	2045	7045	7045	17	928	3762	4326	35	1014	4039	4643
0731	2731	4631	6031	6031	1032	2102	3221	3703	1032	2156	3334	3833
0732	445	845	1445	3045	168	384	772	1870	168	395	810	1985
0733	65	65	65	65	25	30	35	40	43	3400	8981	17032
0734	761	781	1406	4406	295	355	751	2705	313	377	801	2892
0735	420	420	1045	8545	159	191	558	5247	159	191	583	5578
0736	74	74	1324	3324	28	34	707	2041	28	34	757	2473
	23700	33600	55600	89000	8959	15256	29690	54648	13144	37125	80732	145467

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ELK GROVE

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0804																
0805																
0806									34	34	36	44	306	367	454	634
0807	15	47	47	57	675	2538	2961	4104	34	34	124	130	306	367	1562	1872
0808									12	14	51	51	108	151	643	734
0809									12	32	42	42	108	346	529	605
0810									82	97	97	97	738	1048	1222	1397
0811									11	13	13	14	99	140	164	202
0812									62	84	96	96	558	907	1210	1382
0813									62	67	79	79	558	724	995	1138
0814									15	27	36	46	135	292	454	662
0815									15	39	48	64	135	421	605	922
0816	35	41	41	41	1575	2214	2583	2952	17	17	17	17	153	184	214	245
0817									29	29	44	54	261	313	554	778
0818																
0819																
0820									19	24	34	49	171	259	428	706
0821									19	63	63	63	171	680	794	907
0822	46	70	70	80	2070	3780	4410	5760	42	88	101	101	378	950	1273	1454
0823	57	67	67	67	2565	3618	4221	4824	42	99	113	113	378	1069	1424	1627
0824	57	57	57	57	2565	3078	3591	4104	22	26	30	30	198	281	378	432
0825	67	71	71	71	3015	3834	4473	5112	22	45	51	51	198	486	643	734
0826	67	92	92	92	3015	4968	5796	6624	14	60	60	64	126	648	756	922
0827									14	17	32	40	126	184	403	576
0828									6	7	7	7	54	76	88	101
0829									6	6	6	6	54	65	76	86
0830									12	12	13	110	108	130	164	1584
0831									12	12	13	51	108	130	164	734
0832									9	9	14	25	81	97	176	360
0833									9	9	39	39	81	97	491	562
0834	134	188	188	205	6030	10152	11844	14760		16	16	16		173	202	230
0835	77	172	187	202	3465	9288	11781	14544		32	32	32		346	403	461
0836	77	84	84	84	3465	4536	5292	6048								
	632	889	904	956	28440	48006	56952	68832	633	1012	1307	1531	5697	10931	16469	22047

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ELK GROVE

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0804	10	10	10	10	4	5	5	6	4	5	5	6
0805	137	137	137	137	52	62	73	84	52	62	73	84
0806	85	85	485	485	32	39	259	298	32	39	259	298
0807	99	99	899	3899	37	45	480	2394	1018	2950	3895	7132
0808	921	921	4871	4871	348	418	2601	2991	654	785	4163	4863
0809	1198	1698	11448	11448	453	771	6113	7029	561	922	6756	7763
0810	2517	5767	6567	6567	951	2618	3507	4032	1059	2964	4036	4637
0811	4982	8982	8982	8982	1883	4078	4796	5515	2621	5126	6018	6912
0812	4862	5462	5562	5962	1838	2480	2970	3661	1937	2620	3134	3863
0813	4986	13286	13286	13286	1885	6032	7095	8158	2443	6939	8305	9540
0814	2904	4729	4729	4729	1098	2147	2525	2904	1656	2871	3520	4042
0815	532	3407	4057	4057	201	1547	2166	2491	336	1839	2620	3153
0816	195	445	1295	3295	74	202	692	2023	1784	2837	3880	5897
0817	34	34	34	34	13	15	18	21	166	199	232	266
0818	7	7	7	7	3	3	4	4	264	316	558	782
0819	24	24	24	24	9	11	13	15	9	11	13	15
0820	398	398	398	398	150	181	213	244	150	181	213	244
0821	1171	1671	1671	1671	443	759	892	1026	614	1018	1320	1732
0822	294	2732	2732	2732	111	1240	1459	1677	2352	5700	6663	8344
0823	569	2694	2694	2694	215	1223	1439	1654	3158	5791	6933	7932
0824	5799	9874	10674	10674	2192	4483	5700	6554	5135	8630	10715	12285
0825	2087	2087	2087	2087	789	947	1114	1281	4002	5062	5965	6825
0826	185	385	385	460	70	175	206	282	3283	5629	6645	7640
0827	668	1168	1268	1843	253	530	677	1132	379	1178	1433	2054
0828	4451	5701	5701	6701	1682	2588	3044	4114	1808	2772	3447	4690
0829	366	678	678	678	138	308	362	416	192	384	450	517
0830	27	27	27	27	10	12	14	17	64	77	90	103
0831	137	137	237	3237	52	62	127	1988	160	192	291	3572
0932	308	558	658	3908	116	253	351	2400	224	383	515	3134
0833	5618	5768	5768	9768	2124	2619	3080	5998	2205	2716	3256	6358
0834	82	82	182	182	31	37	97	112	6142	10286	12432	15434
0835									3465	9461	11983	14774
0836	147	147	147	147	56	67	78	90	3521	4949	5773	6599
	45800	79200	97700	115000	17313	35957	52170	70611	51450	94894	125591	161490

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

MAINE

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
0907									26	51	51	51	234	551	643	734
0908									15	21	21	21	135	227	265	302
0909									18	25	25	25	162	270	315	360
0910									18	75	110	140	162	810	1386	2016
0911									70	105	118	130	630	1134	1487	1872
0912									70	82	92	92	630	886	1159	1325
0913									27	27	27	27	243	292	340	389
0914									53	88	104	104	477	950	1310	1498
0915									34	77	98	108	306	832	1235	1555
0916									34	45	55	58	306	486	693	835
0917									53	54	54	62	477	583	680	893
0918	29	37	37	37	1305	1998	2331	2664	53	59	64	64	477	637	806	922
0919	6	14	14	14	270	756	882	1008	81	102	110	118	729	1102	1386	1699
0920									81	102	123	123	729	1102	1550	1771
0921									49	63	64	64	441	680	806	922
0922									49	65	76	81	441	702	958	1166
0923									37	80	94	94	333	864	1184	1354
0924									22	23	23	23	198	248	290	331
0925									53	59	59	59	477	637	743	850
0926									62	71	84	84	558	767	1058	1210
0927	5	5	5	5	225	270	315	360	25	25	26	26	225	270	328	374
0928	5	12	12	12	225	648	756	864	44	68	78	88	396	734	983	1267
0929	17	25	25	25	765	1350	1575	1800	54	82	109	109	486	886	1373	1570
0930	17	72	72	72	765	3888	4536	5184	54	89	105	105	486	961	1323	1512
0931	27	34	34	34	1215	1836	2142	2448	27	77	127	177	243	832	1600	2549
0932	27	34	34	34	1215	1836	2142	2448	27	77	117	147	243	832	1474	2117
0933	9	9	9	9	405	486	567	648	38	46	57	57	342	497	718	821
0934	9	9	9	9	405	486	567	648	38	38	42	46	342	410	529	662
0935	1	1	1	1	45	54	63	72	71	71	71	71	639	767	895	1022
0936	1	1	1	1	45	54	63	72	65	65	65	65	585	702	819	936
	153	253	253	253	6885	13662	15939	18216	1348	1912	2249	2419	12132	20651	28336	34834

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

MAINE

ZONE	POPULATION 1965	1975	1985	1995	RESIDENTIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	TOTAL REFUSE TONS PER YEAR 1965	1975	1985	1995
0907	4700	7215	7315	7315	1777	3276	3906	4491	2011	3827	4549	5225
0908	213	2714	2714	2714	81	1232	1449	1666	216	1459	1714	1968
0909	74	624	724	724	28	283	387	445	190	553	702	805
0910	444	5696	5796	5796	168	2586	3095	3559	330	3396	4481	5575
0911	5191	7008	7608	7608	1962	3182	4063	4671	2592	4316	5550	6543
0912	6266	6987	6987	6987	2369	3172	3731	4290	2999	4058	4890	5615
0913	6240	6240	6240	6240	2359	2833	3332	3831	2602	3125	3672	4220
0914	3052	3460	3460	3460	1154	1571	1848	2124	1631	2521	3158	3622
0915	10174	15207	15307	15307	3846	6904	8174	9398	4152	7736	9409	10953
0916	390	993	993	993	336	451	530	610	642	937	1223	1445
0917	2155	2462	2562	2562	815	1118	1368	1573	1292	1701	2048	2466
0918	4449	4764	4864	4864	1682	2163	2597	2986	3464	4798	5734	6572
0919	6590	11612	11612	11612	2491	5272	6201	7130	3490	7130	8469	9837
0920	6498	6819	7169	7169	2456	3096	3828	4402	3185	4198	5378	6173
0921	2457	2865	3315	3315	929	1301	1770	2035	1370	1981	2576	2957
0922	5005	5422	5522	5522	1892	2462	2949	3391	2333	3164	3907	4557
0923	3133	13243	13243	13243	1184	6012	7072	8131	1517	6876	8256	9485
0924	9997	10430	10430	10430	3779	4735	5570	6404	3977	4983	5860	6735
0925	10174	10607	10607	10607	3846	4816	5664	6513	4323	5453	6407	7363
0926	5841	5841	10841	10841	2208	2652	5789	6656	2766	3419	6847	7866
0927	6166	6166	6266	6266	2331	2799	3346	3847	2781	3339	3989	4581
0928	3458	8769	8769	8769	1307	3981	4683	5384	1928	5363	6422	7515
0929	3731	4543	4843	4843	1410	2063	2586	2974	2661	4299	5534	6344
0930	570	772	872	872	215	350	466	535	1466	5199	6325	7231
0931									1458	2668	3742	4997
0932	222	423	423	423	84	192	226	260	1542	2860	3842	4825
0933	2424	3232	3632	3632	916	1467	1939	2230	1663	2450	3224	3699
0934	2367	2367	2367	2367	895	1075	1264	1453	1642	1971	2360	2763
0935	8447	8447	8447	8447	3193	3835	4511	5186	3877	4656	5469	6280
0936	10072	10072	10072	10072	3807	4573	5378	6184	4437	5329	6260	7192
	131000	175000	183000	183000	49520	79452	97722	112359	68537	113765	141997	165409

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1007	15	15	15	15	675	810	945	1080	22	38	43	43	198	410	542	619
1008	15	15	15	15	675	810	945	1080	22	37	37	37	198	400	466	533
1009									104	105	105	105	936	1134	1323	1512
1010									54	59	59	59	486	637	743	850
1014	2	2	2	2	90	108	126	144	71	72	72	72	639	778	907	1037
1015									30	50	62	62	270	540	781	893
1016									98	106	109	109	882	1145	1373	1570
1017	60	60	60	60	2700	3240	3780	4320	31	44	46	46	279	475	580	662
1018	60	60	60	60	2700	3240	3780	4320	31	34	35	35	279	367	441	504
1019	104	104	104	104	4680	5616	6552	7488	40	55	58	58	360	594	731	835
1020	104	122	122	122	4680	6588	7686	8784	40	48	50	50	360	518	630	720
1021									45	53	53	53	405	572	668	763
1022									17	30	31	31	153	324	391	446
1023	46	46	46	46	2070	2484	2898	3312	84	84	84	84	756	907	1058	1210
1026	68	99	99	99	3060	5346	6237	7128	76	91	104	104	684	983	1310	1498
1027	38	38	38	38	1710	2052	2394	2736	44	52	52	52	396	562	655	749
1028									56	76	89	89	504	821	1121	1282
1029	140	209	209	209	6300	11286	13167	15048	37	81	92	92	333	875	1159	1325
1030	83	83	83	83	3735	4482	5229	5976	29	41	42	42	261	443	529	605
1031	31	31	31	31	1395	1674	1953	2232	33	33	34	34	297	356	428	490
1032	44	59	59	59	1980	3186	3717	4248	14	14	14	14	126	151	176	202
1033									25	45	53	53	225	486	668	763
1034	46	46	46	46	2070	2484	2898	3312	80	92	92	92	720	994	1159	1325
1035	50	85	85	85	2250	4590	5355	6120	50	70	78	78	450	756	983	1123
	906	1074	1074	1074	40770	57996	67662	77328	1133	1410	1494	1494	10197	15228	18822	21516

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

NILES

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1007	4284	4284	4601	4601	1619	1945	2457	2825	2492	3165	3944	4524
1008	2458	2501	2501	2501	929	1135	1336	1536	1802	2345	2747	3149
1009	2942	3097	3097	3097	1112	1406	1654	1902	2048	2540	2977	3414
1010	3015	3015	3015	3015	1140	1369	1610	1851	1626	2006	2353	2701
1014	6744	7153	7153	7153	2549	3247	3820	4392	3278	4133	4853	5573
1015	8744	8744	8744	8744	3305	3970	4669	5369	3575	4510	5450	6262
1016	8421	8900	10019	10019	3183	4041	5350	6152	4065	5186	6723	7722
1017	6089	11202	12016	12016	2302	5086	6417	7378	5281	8801	10777	12360
1018	6032	7111	7546	7546	2280	3228	4030	4633	5259	6835	8251	9457
1019	3746	4615	4615	4615	1416	2095	2464	2834	6456	8305	9747	11157
1020	4850	5067	5141	5141	1833	2300	2745	3157	6873	9406	11061	12661
1021	7015	7028	7081	7081	2652	3191	3781	4348	3057	3763	4449	5111
1022	6493	11553	12148	12148	2454	5245	6487	7459	2607	5569	6878	7905
1023	6894	6894	6894	6894	2606	3130	3681	4233	5432	6521	7637	8755
1026	4458	4458	4458	4458	1685	2024	2381	2737	5429	8353	9928	11363
1027	9651	9651	9651	9651	3648	4382	5154	5926	5754	6996	8203	9411
1028	7388	7388	8603	8603	2793	3354	4594	5282	3297	4175	5715	6564
1029		129	255	255		59	136	157	6633	12220	14462	16530
1030		129	255	255		59	136	157	3996	4984	5894	6738
1031		129	255	255		59	136	157	1692	2089	2517	2879
1032		64	64	64		29	34	39	2106	3366	3927	4489
1033	6021	6133	6133	6133	2276	2784	3275	3766	2501	3270	3943	4529
1034	7538	7538	7538	7538	2849	3422	4025	4628	5639	6900	8082	9265
1035	3217	3217	3217	3217	1216	1461	1718	1975	3916	6807	8056	9218
	116000	130000	135000	135000	43847	59021	72090	82893	94814	132245	158574	181737

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

EVANSTON

ZONE	INDUSTRIAL LAND USE ACRE 1965	1975	1985	1995	INDUSTRIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	COMMERCIAL LAND USE ACRE 1965	1975	1985	1995	COMMERCIAL REFUSE TONS PER YEAR 1965	1975	1985	1995
1107									60	60	60	60	540	648	756	864
1118	3	3	3	3	135	162	189	216	53	53	53	53	477	572	668	763
1119	5	5	5	5	225	270	315	360	34	34	34	34	306	367	428	490
1130									23	23	23	23	207	248	290	331
1111									66	66	66	66	594	713	832	950
1112									53	53	53	53	477	572	668	763
1113	1	1	1	1	45	54	63	72	69	69	69	69	621	745	869	994
1124	20	20	20	20	900	1080	1260	1440	68	68	68	68	612	734	857	979
1125	34	34	34	34	1530	1836	2142	2448	78	78	78	78	702	842	983	1123
1130																
	63	63	63	63	2835	3402	3969	4536	504	504	504	504	4536	5441	6351	7257

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

EVANSTON

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1107	7450	7450	7450	7450	2816	3382	3978	4574	3356	4030	4734	5438
1118	9800	9800	9800	9800	3704	4449	5233	6017	4316	5183	6090	6996
1119	13100	13100	13100	13100	4952	5947	6995	8043	5483	6584	7738	8893
1130									207	248	290	331
1111	17500	17500	17500	17500	6615	7945	9345	10745	7209	8658	10177	11695
1112	10150	10150	10150	10150	3837	4608	5420	6232	4314	5180	6088	6995
1113	10750	10750	10750	10750	4064	4881	5741	6601	4730	5680	6673	7667
1124	2675	2675	2675	2675	1011	1214	1428	1642	2523	3028	3545	4061
1125	4100	4100	4100	4100	1550	1861	2189	2517	3782	4539	5314	6088
1130	7675	7675	7675	7675	2901	3484	4098	4712	2901	3484	4098	4712
	83200	83200	83200	83200	31450	37771	44427	51083	38821	46614	54747	62876

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ZONE	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1202	11	11	11	11	495	594	693	792	33	33	33	33	297	356	416	475
1203	22	22	22	22	990	1188	1386	1584	20	33	33	33	180	356	416	475
1204	16	16	16	16	720	864	1008	1152	15	104	104	104	135	1123	1310	1498
1205									10	18	18	18	90	194	227	259
1206									5	33	33	33	45	356	416	475
1207										17	17	17		184	214	245
1209	17	17	17	17	765	918	1071	1224	2	33	33	33	18	356	416	475
1210	34	34	34	34	1530	1836	2142	2448	4	4	4	4	36	43	50	58
1211	17	17	17	17	765	918	1071	1224	17	17	17	17	153	184	214	245
1212	11	11	11	11	495	594	693	792	61	62	62	62	549	670	781	893
1213	14	14	14	14	630	756	882	1008	69	73	73	73	621	788	920	1051
1214	26	26	26	26	1170	1404	1638	1872	20	41	54	54	180	443	680	778
1215	51	51	51	51	2295	2754	3213	3672	24	40	41	41	216	432	517	590
1216	32	32	32	32	1440	1728	2016	2304	22	62	82	92	198	670	1033	1325
1217	12	12	12	12	540	648	756	864	20	68	98	128	180	734	1235	1843
1218	6	6	6	6	270	324	378	432	14	52	52	52	126	562	655	749
1218	14	14	14	14	630	756	882	1008	80	105	105	105	720	1134	1323	1512
1219	39	39	39	39	1755	2106	2457	2808	29	29	29	29	261	313	365	418
1220	25	25	25	25	1125	1350	1575	1800	41	41	61	71	369	443	769	1022
1221	46	46	46	46	2070	2484	2898	3312	42	43	47	47	378	464	592	677
1222	68	68	68	68	3060	3672	4284	4896	42	42	42	42	378	454	529	605
1223	34	34	34	34	1530	1836	2142	2448	34	34	34	34	306	367	428	490
1224	10	10	10	10	450	540	630	720	61	61	61	61	549	659	769	878
1225	11	11	11	11	495	594	693	792	54	54	55	55	486	583	693	792
1226	55	55	55	55	2475	2970	3465	3960	42	42	42	42	378	454	529	605
1227	104	104	104	104	4680	5616	6552	7488	47	49	51	51	423	529	643	734
1228	79	79	79	79	3555	4266	4977	5688	42	45	58	58	378	486	731	835
1229	54	54	54	54	2430	2916	3402	3888	39	49	69	85	351	529	869	1224
1230	47	47	47	47	2115	2538	2961	3384	33	56	56	56	297	605	706	806
1231	61	61	61	61	2745	3294	3843	4392	33	33	33	78	297	356	416	1123
1232	83	83	83	83	3735	4482	5229	5976	36	40	40	40	324	432	504	576
1233	111	111	111	111	4995	5994	6993	7992	45	46	46	46	405	497	580	662
1234	140	140	140	140	6300	7560	8820	10080	54	61	91	121	486	659	1147	1742
1235	73	73	73	73	3285	3942	4599	5256	59	66	91	116	531	713	1147	1670
1236	4	4	4	4	180	216	252	288	61	61	61	61	549	659	769	878
	1327	1327	1327	1327	59715	71658	83601	95544	1210	1647	1826	1992	10890	17787	23009	28683

LEYDEN

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ZONE	POPULATION 1965	1975	1985	1995	RESIDENTIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	TOTAL REFUSE TONS PER YEAR 1965	1975	1985	1995
1202	7984	7984	7984	7984	3018	3625	4263	4902	3810	4575	5372	6169
1203	399	5585	5585	5585	151	2536	2982	3429	1321	4080	4784	5488
1204	1601	1772	1772	1772	605	804	946	1088	1460	2791	3264	3738
1205		3221	3221	3221		1462	1720	1978	90	1656	1947	2237
1206		11016	11016	11016		5001	5883	6764	45	5357	6299	7239
1207		6804	6804	6804		3089	3633	4178		3273	3847	4423
1209	660	3242	3242	3242	249	1472	1731	1991	1032	2746	3218	3690
1210	1450	1450	1450	1450	548	658	774	890	2114	2537	2966	3396
1211	5572	5572	5572	5572	2106	2530	2975	3421	3024	3632	4260	4890
1212	10808	11298	11298	11298	4085	5129	6033	6937	5129	6393	7507	8622
1213	8365	8597	8844	8844	3162	3903	4723	5430	4413	5447	6525	7489
1214	3622	3855	4184	4184	1369	1750	2234	2569	2719	3597	4552	5219
1215	3011	3011	3585	3585	1138	1367	1914	2201	3649	4553	5644	6463
1216	3702	3702	3702	3702	1399	1681	1977	2273	3037	4079	5026	5902
1217		3247	3247	3247		1474	1734	1994	720	2856	3725	4701
1218		3117	3235	3235		1415	1727	1986	396	2301	2760	3167
1218									1350	1890	2205	2520
1219	301	301	301	301	114	137	161	185	2130	2556	2983	3411
1220	301	301	301	301	114	137	161	185	1608	1930	2505	3007
1221	7059	7372	9283	9283	2668	3347	4957	5700	5116	6295	8447	9689
1222	1800	1800	1800	1800	680	817	961	1105	4118	4943	5774	6606
1223	8125	8125	8125	8125	3071	3689	4339	4989	4907	5892	6909	7927
1224	9405	9405	9405	9405	3555	4270	5022	5775	4554	5469	6421	7373
1225	9365	9680	9932	9932	3540	4395	5304	6098	4521	5572	6690	7682
1226	3242	3379	3379	3379	1225	1534	1804	2075	4078	4958	5798	6640
1227	4222	5169	5818	5818	1596	2347	3107	3572	6699	8492	10302	11794
1228	8555	9458	11378	11378	3234	4294	6076	6986	7167	9046	11784	13509
1229	6823	6823	6823	6823	2579	3098	3643	4189	5360	6543	7914	9301
1230	1981	1981	1981	1981	749	899	1058	1216	3161	4042	4725	5406
1231	2040	2040	2040	2040	771	926	1089	1253	3813	4576	5348	6768
1232	9625	11077	11077	11077	3638	5029	5915	6801	7697	9943	11648	13353
1233	5042	5555	5555	5555	1906	2522	2966	3411	7306	9013	10539	12065
1234	2140	4691	4691	4691	809	2130	2505	2880	7595	10349	12472	14702
1235	1260	3830	3830	3830	476	1739	2045	2352	4292	6394	7791	9278
1236	10540	10540	10540	10540	3984	4785	5628	6472	4713	5660	6649	7638
	139000	185000	191000	191000	52539	83991	101990	117275	123144	173436	208600	241502

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

PROVISO

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1301									69	76	83	90	621	821	1046	1296
1302	51	51	51	51	2295	2754	3213	3672	53	56	59	62	477	605	743	893
1303	103	103	103	103	4635	5562	6489	7416	50	58	66	74	450	626	832	1066
1304	85	85	85	85	3825	4590	5355	6120	46	61	84	127	414	659	1058	1829
1305	67	67	67	67	3015	3618	4221	4824	44	56	78	100	396	605	983	1440
1306	44	44	44	44	1980	2376	2772	3168	39	60	91	142	351	648	1147	2045
1307	27	27	27	27	1215	1458	1701	1944	45	57	79	101	405	616	995	1454
1308	51	51	51	51	2295	2754	3213	3672	52	61	70	74	468	659	882	1066
1309	58	58	58	58	2610	3132	3654	4176	48	54	60	66	432	583	756	950
1310	65	65	65	65	2925	3510	4095	4680	45	65	83	96	405	702	1046	1392
1311	36	36	36	36	1620	1944	2268	2592	42	50	53	56	378	540	668	806
1312	12	12	12	12	540	648	756	864	65	76	82	88	585	821	1033	1267
1313	20	20	20	20	900	1080	1260	1440	88	94	100	106	792	1015	1260	1526
1314	40	40	40	40	1800	2160	2520	2880	87	91	95	99	783	983	1197	1426
1315	72	72	72	72	3240	3888	4536	5184	73	92	112	141	657	994	1411	2030
1316	50	50	50	50	2250	2700	3150	3600	62	69	76	83	558	745	958	1195
1317	28	28	28	28	1260	1512	1764	2016	51	58	60	62	459	626	756	893
1318	15	15	15	15	675	810	945	1080	39	45	56	67	351	486	706	965
1319	3	3	3	3	135	162	189	216	30	40	40	40	270	432	504	576
1320	4	4	4	4	180	216	252	288	51	60	62	64	459	648	781	922
1321	2	2	2	2	90	108	126	144	71	83	97	111	639	896	1222	1598
1322									92	97	98	99	828	1048	1235	1426
1323									85	85	85	85	765	918	1071	1224
1324	8	8	8	8	360	432	504	576	72	77	77	77	648	832	970	1109
1325									37	38	39	40	333	410	491	576
1326	24	24	24	24	1080	1296	1512	1728	61	61	61	61	549	659	769	878
1327	47	47	47	47	2115	2538	2961	3384	90	96	97	98	810	1037	1222	1411
1328	25	25	25	25	1125	1350	1575	1800	64	70	71	72	576	756	895	1037
1329	2	2	2	2	90	108	126	144	37	50	61	62	333	540	769	893
1330	2	2	2	2	90	108	126	144	27	55	71	87	243	594	895	1253
1331									12	29	32	35	108	313	403	504
1332									24	24	24	24	216	259	302	346
1333	8	8	8	8	360	432	504	576	52	63	74	75	468	680	932	1080
1334	15	15	15	15	675	810	945	1080	80	87	94	96	720	940	1184	1382
1335	8	8	8	8	360	432	504	576	86	86	86	86	774	929	1084	1238
1336									70	71	72	73	630	767	907	1051
	972	972	972	972	43740	52488	61236	69984	2039	2351	2628	2919	18351	25392	33113	42033

PROVISO

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ZONE	POPULATION 1965	1975	1985	1995	RESIDENTIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	TOTAL REFUSE TONS PER YEAR 1965	1975	1985	1995
1301	16343	16343	16343	16343	6178	7420	8727	10035	6799	8241	9773	11331
1302	6466	6466	6466	6466	2444	2936	3453	3970	5216	6295	7409	8535
1303	17499	17499	17499	17499	6615	7945	9344	10744	11700	14133	16665	19226
1304	7585	7585	7585	7585	2867	3444	4050	4657	7106	8693	10463	12606
1305	3880	3880	3880	3880	1467	1762	2072	2382	4878	5985	7276	8646
1306	1983	1983	1983	1983	750	900	1059	1218	3081	3924	4978	6431
1307	4655	4655	4655	4655	1760	2113	2486	2858	3380	4187	5182	6256
1308	9792	9792	9792	9792	3701	4446	5229	6012	6464	7859	9324	10750
1309	13447	13447	13447	13447	5083	6105	7181	8256	8125	9820	11591	13382
1310	18533	18533	18533	18533	7005	8414	9897	11379	10335	12626	15038	17441
1311	6551	6551	6551	6551	2476	2974	3498	4022	4474	5458	6434	7420
1312	13274	13274	13274	13274	5018	6026	7088	8150	6143	7495	8877	10281
1313	14223	14223	14223	14223	5376	6457	7595	8733	7068	8552	10115	11699
1314	9741	9741	9741	9741	3682	4422	5202	5981	6265	7565	8919	10287
1315	19860	19860	19860	19860	7507	9016	10605	12194	11404	13898	16552	19408
1316	15308	15308	15308	15308	5786	6950	8174	9399	8594	10395	12282	14194
1317	4655	4655	4655	4655	1760	2113	2486	2858	3479	4251	5006	5767
1318	3103	3103	3103	3103	1173	1409	1657	1905	2199	2705	3308	3950
1319	348	564	564	564	132	256	301	346	537	850	994	1138
1320	2586	3221	3221	3221	978	1462	1720	1978	1617	2326	2753	3188
1321	4201	4303	4303	4303	1588	1954	2298	2642	2317	2958	3646	4384
1322	2575	2575	2575	2575	973	1169	1375	1581	1801	2217	2610	3007
1323	316	316	316	316	119	143	169	194	884	1061	1240	1418
1324	399	399	399	399	151	181	213	245	1159	1445	1687	1930
1325	2417	2417	2417	2417	914	1097	1291	1484	1247	1507	1782	2060
1326	1338	1338	1338	1338	506	607	714	822	2135	2562	2995	3428
1327	1335	1335	1335	1335	505	606	713	820	3430	4181	4896	5615
1328	1259	1259	1259	1259	476	572	672	773	2177	2678	3142	3610
1329	1642	2277	2277	2277	621	1034	1216	1398	1044	1682	2111	2435
1330	16	959	959	959	6	435	512	589	339	1137	1533	1986
1331	171	4615	4615	4615	65	2095	2464	2834	173	2408	2867	3338
1332	626	626	626	626	237	284	334	384	453	543	636	730
1333	2648	2648	2648	2648	1001	1202	1414	1626	1829	2314	2850	3282
1334	3473	3473	3473	3473	1313	1577	1855	2132	2708	3327	3984	4594
1335	949	949	949	949	359	431	507	583	1493	1792	2095	2397
1336	1803	1803	1803	1803	682	819	963	1107	1312	1586	1870	2158
	215000	221975	221975	221975	81274	100776	118534	136291	143365	178656	212883	248308

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

BERWYN

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1405	12	12	12	12	540	648	756	864	38	38	38	38	342	410	479	547
1406	5	5	5	5	225	270	315	360	59	59	59	59	531	637	743	850
1407	8	8	8	8	360	432	504	576	68	68	69	69	612	734	869	994
1408	2	2	2	2	90	108	126	144	44	44	44	44	396	475	554	634
1417	57	57	57	57	2565	3078	3591	4104	35	35	38	38	315	378	479	547
1418	16	16	16	16	720	864	1008	1152	57	57	57	57	513	616	718	821
1419	8	8	8	8	360	432	504	576	56	56	56	56	504	605	706	806
1420	82	82	82	82	3690	4428	5166	5904	30	30	30	30	270	324	378	432
1421	162	162	162	162	7290	8748	10206	11664	41	51	61	71	369	551	769	1022
1422																
1427																
1428	131	131	131	131	5895	7074	8253	9432	49	49	112	142	441	529	1411	2045
1429	76	76	76	76	3420	4104	4788	5472	47	47	47	47	423	508	592	677
1430	50	50	50	50	2250	2700	3150	3600	56	56	56	56	504	605	706	806
1431	15	15	15	15	675	810	945	1080	56	56	56	56	504	605	706	806
1432	50	50	50	50	2250	2700	3150	3600	48	48	48	48	432	518	605	691
1433	72	72	72	72	3240	3888	4536	5184	33	33	36	36	297	356	454	518
1434																
	746	746	746	746	33570	40284	46998	53712	717	727	807	847	6453	7851	10169	12196

BERWYN

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ZONE	POPULATION 1965	1975	1985	1995	RESIDENTIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	TOTAL REFUSE TONS PER YEAR 1965	1975	1985	1995
1405	9462	9462	9462	9462	3577	4296	5053	5810	4459	5354	6288	7221
1406	14975	14975	14975	14975	5661	6799	7997	9195	6417	7706	9055	10405
1407	7791	7791	8191	8191	2945	3537	4374	5029	3917	4703	5747	6599
1408	6655	6655	6655	6655	2516	3021	3554	4086	3002	3604	4234	4864
1417	5659	5659	6859	6859	2139	2569	3663	4211	5019	6025	7733	8862
1418	12557	12557	12557	12557	4747	5701	6705	7710	5980	7181	8431	9683
1419	17665	17665	17665	17665	6677	8020	9433	10846	7541	9057	10643	12228
1420	18064	18064	18064	18064	6828	8201	9646	11091	10788	12953	15190	17427
1421	11336	11336	11336	11336	4285	5147	6053	6960	11944	14446	17028	19646
1422	4541	4541	4541	4541	1716	2062	2425	2788	1716	2062	2425	2788
1427	3225	3225	3225	3225	1219	1464	1722	1980	1219	1464	1722	1980
1428	14402	14402	15602	15602	5444	6539	8331	9580	11780	14142	17995	21057
1429	11951	11951	11951	11951	4517	5426	6382	7338	8360	10038	11762	13487
1430	12155	12155	12155	12155	4595	5518	6491	7463	7349	8823	10347	11869
1431	17295	17295	17295	17295	6538	7852	9236	10619	7717	9267	10887	12505
1432	14840	14840	14840	14840	5610	6737	7925	9112	8292	9955	11680	13403
1433	6688	6688	7888	7888	2528	3036	4212	4843	6065	7280	9202	10545
1434	739	739	739	739	279	336	395	454	279	336	395	454
	190000	190000	194000	194000	71821	86261	103597	119115	111844	134396	160764	185023

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

STICKNEY

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1504	64	64	64	64	2880	3456	4032	4608	12	19	23	23	108	205	290	331
1505	43	43	43	43	1935	2322	2709	3096	14	29	41	41	126	313	517	590
1506	34	34	34	34	1530	1836	2142	2448	31	33	40	40	279	356	504	576
1507	34	34	34	34	1530	1836	2142	2448	29	29	84	139	261	313	1058	2002
1508	43	43	43	43	1935	2322	2709	3096	18	18	18	18	162	194	227	259
1509	61	61	61	61	2745	3294	3843	4392	21	21	23	23	189	227	290	331
1519	82	82	82	82	3690	4428	5166	5904	13	57	70	70	117	616	862	1008
1520	86	86	86	86	3870	4644	5418	6192	16	16	16	16	144	173	202	230
1521	120	120	120	120	5400	6480	7560	8640	21	28	83	138	189	302	1046	1987
1528	77	77	77	77	3465	4158	4851	5544	25	30	36	36	225	324	454	518
1529	23	23	23	23	1035	1242	1449	1656	20	38	42	42	180	410	529	605
1530	7	7	7	7	315	378	441	504	18	81	108	113	162	875	1361	1627
1531									36	79	106	113	324	853	1336	1627
1532	6	6	6	6	270	324	378	432	23	39	49	54	207	421	617	778
1533	6	6	6	6	270	324	378	432	38	42	48	48	342	454	605	691
	686	686	686	686	30870	37044	43218	49392	335	559	787	914	3015	6036	9918	13160

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

STICKNEY

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1504	1802	1802	1912	1912	681	818	1021	1174	366[illegible]	4479	5343	6113
1505			986	986			527	605	2061	2635	3753	4291
1506	5845	6645	9494	9494	2209	3017	5070	5829	4018	5209	7716	8853
1507	6391	6391	6391	6391	2416	2902	3413	3924	4207	5051	6613	8374
1508	3826	3826	3826	3826	1446	1737	2043	2349	3543	4253	4979	5704
1509	6173	6173	6611	6611	2333	2803	3530	4059	5267	6324	7663	8782
1519	1750	3000	4370	4370	662	1362	2334	2683	4469	6406	8382	9595
1520	1628	1628	1628	1628	615	739	869	1000	4629	5556	6489	7422
1521	1876	1876	1876	1876	709	852	1002	1152	6298	7634	9608	11779
1528	1766	1766	1985	1985	668	802	1060	1219	4358	5284	6365	7281
1529	1093	3643	3643	3643	413	1654	1945	2237	1628	3306	3923	4498
1530	1383	10088	12882	12882	525	4580	6879	7910	1002	5833	8681	10041
1531	2565	4365	7269	7269	970	1982	3882	4463	1294	2835	5218	6090
1532	2397	4697	4697	4697	906	2132	2508	2884	1383	2877	3503	4094
1533		1400	4030	4030		636	2152	2474	612	1414	3135	3597
	38500	57300	71600	71600	14553	26016	38235	43962	48438	69096	91371	106514

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

LYONS

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1601	64	64	64	64	2880	3456	4032	4608	61	67	67	72	549	724	844	1037
1602	94	94	94	94	4230	5076	5922	6768	65	78	90	95	585	842	1134	1368
1603	96	96	96	96	4320	5184	6048	6912	51	57	65	68	459	616	819	979
1604	48	48	48	48	2160	2592	3024	3456	43	63	75	87	387	680	945	1253
1605									36	44	47	47	324	475	592	677
1606									31	56	82	103	279	605	1033	1483
1607									51	52	64	64	459	562	806	922
1608									48	61	78	90	432	659	983	1296
1609	89	89	89	89	4005	4806	5607	6408	35	66	86	106	315	713	1084	1526
1610	177	177	177	177	7965	9558	11151	12744	21	21	21	21	189	227	265	302
1611	150	150	150	150	6750	8100	9450	10800	18	18	18	18	162	194	227	259
1612	80	80	80	80	3600	4320	5040	5760	29	33	36	39	261	356	454	562
1613	80	80	80	80	3600	4320	5040	5760	32	41	47	53	288	443	592	763
1614	90	90	90	90	4050	4860	5670	6480	14	14	14	14	126	151	176	202
1615	91	91	91	91	4095	4914	5733	6552	11	19	27	35	99	205	340	504
1616	45	45	45	45	2025	2430	2835	3240	21	62	90	115	189	670	1134	1656
1617									31	41	57	67	279	443	718	965
1618	5	5	5	5	225	270	315	360	34	62	77	92	306	670	970	1325
1619	10	10	10	10	450	540	630	720	17	47	77	110	153	508	970	1584
1620									15	25	35	45	135	270	441	648
1621	2	2	2	2	90	108	126	144	7	7	8	8	63	76	101	115
1622	4	4	4	4	180	216	252	288				7				101
1623	48	48	48	48	2160	2592	3024	3456	10	32	49	66	90	346	617	950
1624	88	88	88	88	3960	4752	5544	6336	15	34	46	58	135	367	580	835
1625	23	23	23	23	1035	1242	1449	1656	6	31	53	74	54	335	668	1066
1626	17	17	17	17	765	918	1071	1224	3	13	22	31	27	140	277	446
1627	2	2	2	2	90	108	126	144	4	16	21	26	36	173	265	374
1628	6	6	6	6	270	324	378	432	7	8	8	8	63	86	101	115
1629	10	10	10	10	450	540	630	720	11	13	13	31	99	140	164	446
1630	10	10	10	10	450	540	630	720	26	67	102	107	234	724	1285	1541
1631	10	10	10	10	450	540	630	720	35	45	46	46	315	486	580	662
1632	20	20	20	20	900	1080	1260	1440	8	22	32	42	72	238	403	605
1633	10	10	10	10	450	540	630	720	6	17	22	27	54	184	277	389
1634									8	28	49	69	72	302	617	994
1635									4	12	20	28	36	130	252	403
1636									11	34	58	79	99	367	731	1138
	1369	1369	1369	1369	61605	73926	86247	98568	825	1306	1702	2048	7425	14107	21445	29491

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

LYONS

ZONE	POPULATION 1965	1975	1985	1995	RESIDENTIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	TOTAL REFUSE TONS PER YEAR 1965	1975	1985	1995
1601	4021	4371	4371	4371	1520	1984	2334	2684	4949	6164	7210	8329
1602	6363	7613	8213	8213	2405	3456	4386	5043	7220	9374	11442	13179
1603		1200	2800	2800		545	1495	1719	4779	6345	8362	9610
1604	9850	11050	11150	11150	3723	5017	5954	6846	6270	8289	9923	11555
1605	10536	13386	14886	14886	3983	6077	7949	9140	4307	6552	8541	9817
1606	3475	5625	7775	8175	1314	2554	4152	5019	1593	3159	5185	6502
1607	5136	5636	10486	10486	1941	2559	5600	6438	2400	3121	6406	7360
1608	1738	2938	5738	6338	657	1334	3064	3892	1089	1993	4047	5188
1609	9568	13768	13768	13768	3617	6251	7352	8454	7937	11770	14043	16388
1610									8154	9785	11416	13046
1611	552	552	552	552	209	251	295	339	7121	8545	9972	11398
1612	558	858	858	858	211	390	458	527	4072	5066	5952	6849
1613	4097	5197	5197	5197	1549	2359	2775	3191	5437	7122	8407	9714
1614									4176	5011	5846	6682
1615									4194	5119	6073	7056
1616	2160	6185	7385	7385	816	2808	3944	4534	3030	5908	7913	9430
1617	5019	5119	5419	5419	1897	2324	2894	3327	2176	2767	3612	4292
1618	1744	6744	6744	6744	659	3062	3601	4141	1190	4002	4886	5826
1619	1010	1010	1010	2260	382	459	539	1388	985	1507	2139	3692
1620	2747	2747	2747	2747	1038	1247	1467	1687	1173	1517	1908	2335
1621			400	400			214	246	153	184	441	505
1622	775	975	975	3475	293	443	521	2134	473	659	773	2523
1623									2250	2938	3641	4406
1624	2712	3612	3612	3612	1025	1640	1929	2218	5120	6759	8053	9389
1625	4813	6213	6213	6213	1819	2821	3318	3815	2908	4398	5435	6537
1626	945	1145	1345	1345	357	520	718	826	1149	1578	2066	2496
1627	2554	3154	3254	3254	965	1432	1738	1998	1091	1713	2129	2516
1628	94	294	294	294	36	133	157	181	369	543	636	728
1629	446	1071	1071	1696	169	486	572	1041	718	1166	1366	2207
1630	1297	6710	11810	11810	490	3046	6307	7251	1174	4310	8222	9512
1631	364	4501	4601	4601	138	2043	2457	2825	903	3069	3667	4207
1632	963	2313	2313	2313	364	1050	1235	1420	1336	2368	2898	3465
1633	998	998	998	998	377	453	533	613	881	1177	1440	1722
1634	892	992	1392	1392	337	450	743	855	409	752	1360	1849
1635	3639	3939	4339	4964	1376	1788	2317	3048	1412	1918	2569	3451
1636	3334	4034	4234	4234	1260	1831	2261	2600	1359	2198	2992	3738
	92400	133950	155950	161950	34927	60813	83279	99440	103957	148846	190971	227499

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

LEMONT

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1713	2	2	2	2	90	108	126	144	16	16	16	16	144	173	202	230
1714	4	4	4	4	180	216	252	288								
1719	6	8	8	8	360	432	504	576				1				14
1720	17	17	17	17	765	918	1071	1224	249	251	253	255	2241	2711	3188	3672
1721	13	13	13	13	585	702	819	936				4				58
1722	9	9	9	9	405	486	567	648	159	159	159	165	1431	1717	2003	2376
1723	5	5	5	5	225	270	315	360			6	7			76	101
1724											6	7			76	101
1725												6				86
1726	2	2	2	2	90	108	126	144			1	3			13	43
1727	5	5	5	5	225	270	315	360	40	40	63	67	360	432	794	965
1728	6	6	6	6	270	324	378	432	69	74	80	85	621	799	1008	1224
1729	8	8	8	8	360	432	504	576	135	162	172	181	1215	1750	2167	2606
1730	4	4	4	4	180	216	252	288		34	91	106		367	1147	1526
1731												122				1757
1732											36	51			454	734
1733											25	36			315	518
1734										2	7	15		22	88	216
1735											2	2			25	29
1736																
	83	83	83	83	3735	4482	5229	5976	668	738	917	1129	6012	7971	11556	16256

LEMONT

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1713	48	48	48	48	18	22	26	29	252	303	354	403
1714	48	48	48	48	18	22	26	29	198	238	278	317
1719	121	121	121	121	46	55	65	74	406	487	569	664
1720	1581	1581	1581	1581	598	718	844	971	3604	4347	5103	5867
1721	48	148	248	409	18	67	132	251	603	769	951	1245
1722	145	145	145	317	55	66	77	195	1891	2269	2647	3219
1723	243	443	600	600	92	201	320	368	317	471	711	829
1724	145	145	613	613	55	66	327	376	55	66	403	477
1725	82	82	82	530	31	37	44	325	31	37	44	411
1726	121	121	171	332	46	55	91	204	136	163	230	391
1727	97	97	2335	2335	37	44	1247	1434	622	746	2356	2759
1728	631	1256	1568	1773	239	570	837	1089	1130	1693	2223	2745
1729	2595	5466	5541	5541	981	2482	2959	3402	2556	4664	5630	6584
1730	306	4077	9102	9102	116	1851	4860	5589	296	2434	6259	7403
1731	131	131	131	10694	50	59	70	6566	50	59	70	8323
1732	412	412	3537	4497	156	187	1889	2761	156	187	2343	3495
1733	320	320	2508	3148	121	145	1339	1933	121	145	1654	2451
1734	121	321	683	1323	46	146	365	812	46	168	453	1028
1735	127	135	285	285	48	61	152	175	48	61	177	204
1736	78	78	78	78	29	35	42	48	29	35	42	48
	7400	15175	29425	43375	2800	6889	15712	26631	12547	19342	32497	48863

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1801		2	2	2		108	126	144	25	25	35	77	225	270	441	1109
1802									17	17	27	73	153	184	340	1051
1803									7	17	27	70	63	184	340	1008
1804	5	5	5	5	225	270	315	360	5	5	5	5	45	54	63	72
1805	10	10	10	10	450	540	630	720	4	4	4	4	36	43	50	58
1806	6	6	6	6	270	324	378	432	8	8	8	8	72	86	101	115
1807	2	2	2	2	90	108	126	144	3	3	3	3	27	32	38	43
1808																
1809									6	6	6	6	54	65	76	86
1810									11	21	33	44	99	227	416	634
1811									13	13	26	42	117	140	328	605
1812	4	4	14	14	180	216	882	1008	20	20	32	114	180	216	403	1642
1813	6	6	6	6	270	324	378	432	51	51	64	105	459	551	806	1512
1814	1	1	1	1	45	54	63	72	12	12	18	44	108	130	227	634
1815									6	6	12	47	54	65	151	677
1816									3	3	3	3	27	32	38	43
1817																
1818	1	1	1	1	45	54	63	72	2	2	2	2	18	22	25	29
1819												1				14
1820																
1821																
1822												4				58
1823	1	1	1	1	45	54	63	72	5	5	17	67	45	54	214	965
1824	4	4	4	4	180	216	252	288	19	20	49	115	171	216	617	1656
1825	2	2	2	2	90	108	126	144	42	57	62	118	378	616	781	1699
1826	1	1	1	1	45	54	63	72	59	60	61	61	531	648	769	878
1827									41	49	54	64	369	529	680	922
1828										1	4	4		11	50	58
1829											4	7			50	101
1830									28	28	28	33	252	302	353	475
1831												2				29
1832										25	28	38		270	353	547
1833									32	37	63	93	288	400	794	1339
1834										1	13	45		11	164	648
1835									5	10	11	11	45	108	139	158
1836									2	4	14	49	18	43	176	706
	43	45	55	55	1935	2430	3465	3960	426	510	713	1359	3834	5509	8983	19571

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

PALOS

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1801	2079	2079	2079	8679	786	944	1110	5329	1011	1322	1677	6582
1802	1663	1663	1663	3763	629	755	888	2310	782	939	1228	3361
1803	1386	1386	1386	6286	524	629	740	3860	587	813	1080	4868
1804									270	324	378	432
1805									486	583	680	778
1806									342	410	479	547
1807									117	140	164	187
1808												
1809									54	65	76	86
1810	317	317	1017	1317	120	144	543	809	219	371	959	1443
1811	1267	1267	2267	2667	479	575	1211	1638	596	715	1539	2243
1812	701	701	1351	2151	265	318	721	1321	625	750	2006	3971
1813	3242	3242	4492	5042	1225	1472	2399	3096	1954	2347	3583	5040
1814	950	950	1650	1850	359	431	881	1136	512	615	1171	1842
1815	119	119	519	4119	45	54	277	2529	99	119	428	3206
1816									27	32	38	43
1817												
1818									63	76	88	101
1819	48	48	48	248	18	22	26	152	18	22	26	166
1820												
1821												
1822				1600				982				1040
1823	258	258	1108	1208	98	117	592	742	188	225	869	1779
1824	1287	1337	3587	4337	486	607	1915	2663	837	1039	2784	4607
1825	2871	5071	5071	5171	1085	2302	2708	3175	1553	3026	3615	5018
1826	990	1690	1790	1790	374	767	956	1099	950	1469	1788	2049
1827	792	1792	1992	1992	299	814	1064	1223	669	1343	1744	2145
1828	198	698	1948	1948	75	317	1040	1196	75	328	1090	1254
1829	159	159	1409	2459	60	72	752	1510	60	72	802	1611
1830	91	91	91	1741	34	41	49	1069	286	343	402	1544
1831	71	71	71	921	27	32	38	565	27	32	38	594
1832	99	9299	10549	14299	37	4222	5633	8780	37	4492	5986	9327
1833	16	1716	7966	7966	6	779	4254	4891	294	1179	5048	6230
1834	91	441	1241	1841	34	200	663	1130	34	211	827	1778
1835	1267	3017	3217	3417	479	1370	1718	2098	524	1478	1857	2256
1836	238	1088	1088	1088	90	494	581	668	108	537	757	1374
	20200	38500	57600	87900	7634	17478	30759	53971	13403	25417	43207	77502

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1901									47	53	56	61	423	572	706	878
1902	4	4	4	4	180	216	252	288	43	45	51	51	387	486	643	734
1903	21	21	21	21	945	1134	1323	1512	72	92	114	136	648	994	1436	1958
1904	17	17	17	17	765	918	1071	1224	70	72	77	78	630	778	970	1123
1905									24	45	57	59	216	486	718	850
1906									24	35	60	75	216	378	756	1080
1907	15	15	15	15	675	810	945	1080	19	64	79	88	171	691	995	1267
1908	11	11	11	11	495	594	693	792	21	30	31	31	189	324	391	446
1909	17	17	17	17	765	918	1071	1224	53	65	65	68	477	702	819	979
1910	21	21	21	21	945	1134	1323	1512	57	86	99	105	513	929	1247	1512
1911	4	4	4	4	180	216	252	288	48	48	57	57	432	518	718	821
1912									57	57	65	69	513	616	819	994
1915									38	60	71	84	342	648	895	1210
1916	5	5	5	5	225	270	315	360	38	63	87	115	342	680	1096	1656
1917	21	21	21	21	945	1134	1323	1512	3	17	17	17	27	184	214	245
1918	21	21	21	21	945	1134	1323	1512	39	80	100	115	351	864	1260	1656
1919	13	13	13	13	585	702	819	936	41	52	64	68	369	562	806	979
1920	21	21	21	21	945	1134	1323	1512	6	6	19	32	54	65	239	461
1921	10	10	10	10	450	540	630	720	22	23	23	23	198	248	290	331
1922	4	4	4	4	180	216	252	288	19	21	21	21	171	227	265	302
1923	25	25	25	25	1125	1350	1575	1800	13	34	42	50	117	367	529	720
1924	25	25	25	25	1125	1350	1575	1800	19	40	50	62	171	432	630	893
1925	64	64	64	64	2880	3456	4032	4608	48	70	78	80	432	756	983	1152
1926	76	76	76	76	3420	4104	4788	5472	22	43	51	59	198	464	643	850
1927	15	15	15	15	675	810	945	1080	15	48	61	74	135	518	769	1066
1928	5	5	5	5	225	270	315	360	6	14	72	126	54	151	907	1814
1929	10	10	10	10	450	540	630	720	5	5	24	40	45	54	302	576
1930	6	6	6	6	270	324	378	432	29	29	50	66	261	313	630	950
1931									4	4	15	17	36	43	189	245
1932									4	4	4	6	36	43	50	86
1933									6	16	17	20	54	173	214	288
1934	15	15	15	15	675	810	945	1080	7	27	55	55	63	292	693	792
1935	58	58	58	58	2610	3132	3654	4176	25	25	31	31	225	270	391	446
1936	62	62	62	62	2790	3348	3906	4464	49	53	56	56	441	572	706	806
	566	566	566	566	25470	30564	35658	40752	993	1426	1819	2095	8937	15400	22919	30166

WORTH

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
1901	9200	9700	10600	12800	3478	4404	5660	7859	3901	4976	6366	8737
1902	8850	9550	12050	12050	3345	4336	6435	7399	3912	5038	7330	8421
1903	7475	8375	8975	9975	2826	3802	4793	6125	4419	5930	7552	9595
1904	8475	9175	11175	11375	3204	4165	5967	6984	4599	5861	8008	9331
1905	7650	8600	9400	10200	2892	3904	5020	6263	3108	4390	5738	7113
1906	2800	3200	5200	5200	1058	1453	2777	3193	1274	1831	3533	4273
1907	2400	4200	5950	5950	907	1907	3177	3653	1753	3408	5117	6000
1908	3500	5050	5650	5650	1323	2293	3017	3469	2007	3211	4101	4707
1909	6475	11075	11075	12275	2448	5028	5914	7537	3690	6648	7804	9740
1910	5850	7650	8550	10750	2211	3473	4566	6601	3669	5536	7136	9625
1911	10600	10700	14200	14200	4007	4858	7583	8719	4619	5592	8553	9828
1912	4375	4475	7675	9075	1654	2032	4098	5572	2167	2648	4917	6566
1915	3400	4200	5000	6600	1285	1907	2670	4052	1627	2555	3565	5262
1916	2000	2500	2500	3900	756	1135	1335	2395	1323	2085	2746	4411
1917	9200	12800	12800	12800	3478	5811	6835	7859	4450	7129	8372	9616
1918	2960	5860	7060	7360	1119	2660	3770	4519	2415	4658	6353	7687
1919	4900	5300	10050	11750	1852	2406	5367	7215	2806	3670	6992	9130
1920	126	126	1176	1176	48	57	628	722	1047	1256	2190	2695
1921	1050	1600	1600	1600	397	726	854	982	1045	1514	1774	2033
1922	1750	2550	2550	2550	662	1158	1362	1566	1013	1601	1879	2156
1923	2235	2635	2635	2635	845	1196	1407	1618	2087	2913	3511	4138
1924	2120	2320	2320	3120	801	1053	1239	1916	2097	2835	3444	4609
1925	9060	10110	11110	11910	3425	4590	5933	7313	6737	8802	10948	13073
1926	350	950	950	950	132	431	507	583	3750	4999	5938	6905
1927	770	3420	3420	3420	291	1553	1826	2100	1101	2881	3540	4246
1928	501	3751	4051	4051	189	1703	2163	2487	468	2124	3385	4661
1929	1050	1050	2250	2550	397	477	1202	1566	892	1071	2134	2862
1930	2800	2800	4900	4900	1058	1271	2617	3009	1589	1908	3625	4391
1931	963	963	1063	1913	364	437	568	1175	400	480	757	1420
1932	1085	1085	1185	2185	410	493	633	1342	446	536	683	1428
1933	2450	2450	2850	4000	926	1112	1522	2456	980	1285	1736	2744
1934	420	470	3520	3620	159	213	1880	2223	897	1315	3518	4095
1935	350	350	2900	2900	132	159	1549	1781	2967	3561	5594	6403
1936	2810	4460	5610	5610	1062	2025	2996	3445	4293	5945	7608	8715
	130000	163500	202000	221000	49141	74228	107870	135698	83548	120192	166447	206616

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ZONE	INDUSTRIAL LAND USE ACRE 1965	1975	1985	1995	INDUSTRIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	COMMERCIAL LAND USE ACRE 1965	1975	1985	1995	COMMERCIAL REFUSE TONS PER YEAR 1965	1975	1985	1995
2029	4	4	4	4	180	216	252	288	18	18	18	18	162	194	227	259
2030	30	30	30	30	1350	1620	1890	2160	47	71	91	91	423	767	1147	1310
2031	31	31	31	31	1395	1674	1953	2232	45	71	101	123	405	767	1273	1771
2032	34	34	34	34	1530	1836	2142	2448	18	27	27	27	162	292	340	389
2033	45	45	45	45	2025	2430	2835	3240	10	18	23	25	90	194	290	360
	144	144	144	144	6480	7776	9072	10368	138	205	260	284	1242	2214	3277	4089

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

CALUMET

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
2029	10052	10052	10052	10052	3800	4564	5368	6172	4142	4974	5847	6719
2030	3982	5403	5403	5403	1505	2453	2885	3317	3278	4840	5922	6787
2031	4700	5309	8409	8409	1777	2410	4490	5163	3577	4851	7716	9166
2032	4766	8218	8218	8218	1802	3731	4388	5046	3494	5859	6870	7883
2033		1218	1218	1218		553	650	748	2115	3177	3775	4348
	23500	30200	33300	33300	8884	13711	17781	20446	16606	23701	30130	34903

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ORLAND

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
2101											1	7			13	101
2102									4	4	32	37	36	43	403	533
2103									9	15	72	82	81	162	907	1181
2104	4	4	4	4	180	216	252	288	10	10	10	10	90	108	126	144
2105	9	9	9	9	405	486	567	648								
2106	4	4	4	4	180	216	252	288								
2107	9	9	9	9	405	486	567	648								
2108	18	18	18	18	810	972	1134	1296		1	31	41		11	391	590
2109	9	9	9	9	405	486	567	648	15	23	85	100	135	248	1071	1440
2110									18	25	78	89	162	270	983	1282
2111									9	15	18	19	81	162	227	274
2112																
2113									2	2	2	2	18	22	25	29
2114	1	1	1	1	45	54	63	72	7	7	15	16	63	76	189	230
2115	2	2	2	2	90	108	126	144	19	19	47	52	171	205	592	749
2116	6	6	6	6	270	324	378	432	13	16	28	31	117	173	353	446
2117	9	9	9	9	405	486	567	648				43				619
2118	4	4	4	4	180	216	252	288				5				72
2119												68				979
2120												52				749
2121	2	2	2	2	90	108	126	144	4	4	4	36	36	43	50	518
2122	4	4	4	4	180	216	252	288	8	9	26	29	72	97	328	418
2123	2	2	2	2	90	108	126	144	13	19	31	35	117	205	391	504
2124									4	4	4	4	36	43	50	58
2125									92	104	116	123	828	1123	1462	1771
2126	1	1	1	1	45	54	63	72	4	28	33	39	36	302	416	562
2127	2	2	2	2	90	108	126	144	5	21	26	30	45	227	328	432
2128	1	1	1	1	45	54	63	72	3	3	3	3	27	32	38	43
2129												3				43
2130												70				1008
2131												119				1714
2132																
2133									2	2	2	2	18	22	25	29
2134									3	3	14	19	27	32	176	274
2135									3	24	31	39	27	259	391	562
2136									267	267	268	274	2403	2884	3377	3946
	87	87	87	87	3915	4698	5481	6264	514	625	977	1479	4626	6749	12312	21300

ORLAND

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
2101	269	429	629	629	87	195	336	386	87	195	349	487
2102	91	91	2841	2841	34	41	1517	1744	70	84	1920	2277
2103	283	783	6333	6333	107	355	3382	3888	188	517	4289	5069
2104	20	20	20	20	8	9	11	12	278	333	339	444
2105	55	55	55	55	21	25	29	34	426	511	596	682
2106	55	55	55	55	21	25	29	34	201	241	281	322
2107	33	33	33	33	12	15	18	20	417	501	585	668
2108	150	150	3150	3550	57	68	1682	2180	867	1051	3207	4066
2109	2788	3388	8988	8988	1054	1538	4800	5519	1594	2272	6438	7607
2110	938	1588	6588	6588	355	721	3518	4045	517	991	4501	5327
2111	309	659	939	939	117	299	501	577	198	461	728	851
2112	77	77	97	97	29	35	52	60	29	35	52	60
2113	43	43	43	43	16	20	23	26	34	42	48	55
2114	55	55	817	817	21	25	436	502	129	155	688	804
2115	24	24	2834	2834	9	11	1513	1740	270	324	2231	2633
2116	765	965	2005	2005	289	438	1071	1231	676	935	1802	2109
2117	94	94	94	3694	36	43	50	2268	441	529	617	3535
2118	276	276	276	476	104	125	147	292	284	341	399	652
2119	40	40	40	5820	15	18	21	3573	15	18	21	4552
2120	98	98	98	4498	37	44	52	2762	37	44	52	3511
2121	46	46	46	2746	17	21	25	1686	143	172	201	2348
2122	329	429	2079	2079	124	195	1110	1277	376	508	1690	1983
2123	572	1334	2322	2322	216	606	1240	1426	423	919	1757	2074
2124	40	40	40	40	15	18	21	25	51	61	71	83
2125	1589	3839	4439	4439	601	1743	2370	2726	1429	2866	3832	4497
2126	516	3479	3479	3479	195	1579	1858	2136	276	1935	2337	2770
2127	439	1964	2164	2164	166	892	1156	1329	301	1227	1610	1965
2128	94	94	94	94	36	43	50	58	108	129	151	173
2129	192	192	192	292	73	87	103	179	73	87	103	222
2130	46	46	46	5986	17	21	25	3675	17	21	25	4683
2131	34	34	34	10214	13	15	18	6271	13	15	18	7985
2132	29	29	29	29	11	13	15	18	11	13	15	18
2133	29	29	29	29	11	13	15	18	29	35	40	47
2134	65	65	1165	1465	25	30	622	900	52	62	798	1174
2135	17	2517	2867	3167	6	1143	1531	1945	33	1402	1922	2507
2136	40	240	240	240	15	109	128	147	2418	2993	3505	4093
	10500	23300	55200	89100	3970	10578	29475	54709	12511	22025	47268	82273

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

BREMEN

ZONE	INDUSTRIAL LAND USE ACRE 1965	1975	1985	1995	INDUSTRIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	COMMERCIAL LAND USE ACRE 1965	1975	1985	1995	COMMERCIAL REFUSE TONS PER YEAR 1965	1975	1985	1995
2201	24	24	24	24	1080	1296	1512	1728	41	54	78	82	369	583	983	1181
2202	8	8	8	8	360	432	504	576	49	70	90	90	441	756	1134	1296
2203	4	4	4	4	180	216	252	288	43	63	99	104	387	680	1247	1498
2204									19	37	79	82	171	400	995	1181
2205									2	2	3	3	18	22	38	43
2206									1	1	1	1	9	11	13	14
2207											7	7			88	101
2208									6	6	26	26	54	65	328	374
2209									17	39	71	72	153	421	895	1037
2210									35	62	83	100	315	670	1046	1440
2211	2	2	2	2	90	108	126	144	53	81	92	96	477	875	1159	1382
2212	3	3	3	3	135	162	189	216	44	67	88	89	396	724	1109	1282
2213	2	2	2	2	90	108	126	144	40	40	40	43	360	432	504	619
2214	1	1	1	1	45	54	63	72	51	55	57	73	459	594	718	1051
2215									19	30	45	46	171	324	567	662
2216	1	1	1	1	45	54	63	72	24	52	78	80	216	562	983	1152
2217	2	2	2	2	90	108	126	144	2	21	64	66	18	227	806	950
2218	1	1	1	1	45	54	63	72	2	2	34	34	18	22	428	490
2219	2	2	2	2	90	108	126	144	4	6	16	16	36	65	202	230
2220	4	4	4	4	180	216	252	288	3	4	4	4	27	43	50	58
2221	2	2	2	2	90	108	126	144	35	38	43	48	315	410	542	691
2222									68	71	174	174	612	767	2192	2506
2223									60	62	63	63	540	670	794	907
2224									44	44	46	46	396	475	580	662
2225	3	3	3	3	135	162	189	216	28	28	90	111	252	302	1134	1598
2226	1	1	1	1	45	54	63	72	19	19	48	48	171	205	605	691
2227									2	22	76	86	18	238	958	1238
2228	2	2	2	2	90	108	126	144	3	23	56	92	27	248	706	1325
2229	4	4	4	4	180	216	252	288	5	6	9	14	45	65	113	202
2230	2	2	2	2	90	108	126	144	4	7	11	31	36	76	139	446
2231	2	2	2	2	90	108	126	144	47	53	85	119	423	572	1071	1714
2232	4	4	4	4	180	216	252	288	28	28	30	35	252	302	378	504
2233	2	2	2	2	90	108	126	144	25	25	56	93	225	270	706	1339
2234											21	40			265	576
2235	3	3	3	3	135	162	189	216	2	2	23	56	18	22	290	806
2236	5	5	5	5	225	270	315	360	4	4	28	35	36	43	353	504
	84	84	84	84	3780	4536	5292	6048	829	1124	1914	2205	7461	12141	24119	31750

BREMEN

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ZONE	POPULATION 1965	POPULATION 1975	POPULATION 1985	POPULATION 1995	RESIDENTIAL REFUSE TONS PER YEAR 1965	RESIDENTIAL REFUSE TONS PER YEAR 1975	RESIDENTIAL REFUSE TONS PER YEAR 1985	RESIDENTIAL REFUSE TONS PER YEAR 1995	TOTAL REFUSE TONS PER YEAR 1965	TOTAL REFUSE TONS PER YEAR 1975	TOTAL REFUSE TONS PER YEAR 1985	TOTAL REFUSE TONS PER YEAR 1995
2201	1568	2568	3168	3768	593	1166	1692	2314	2042	3045	4187	5223
2202	11096	11696	11746	11746	4194	5310	6272	7212	4995	6498	7910	9084
2203	784	884	3134	4934	296	401	1674	3029	863	1297	3173	4815
2204	1176	1176	3876	4876	445	534	2070	2994	616	934	3065	4175
2205	90	90	190	190	34	41	101	117	52	63	139	160
2206									9	11	13	14
2207	20	20	2520	2520	8	9	1346	1547	8	9	1434	1648
2208	628	628	8428	8428	237	285	4501	5175	291	350	4829	5549
2209	1568	2368	2868	3468	593	1075	1532	2129	746	1496	2427	3166
2210	7156	9856	10156	10756	2705	4475	5423	6604	3020	5145	6469	8044
2211	14704	17604	18204	19604	5558	7992	9721	12037	6125	8975	11006	13563
2212	3940	4940	5440	5740	1489	2243	2905	3524	2020	3129	4203	5022
2213	471	471	471	1671	178	214	252	1026	628	754	882	1789
2214	1960	3260	4160	10260	741	1480	2221	6300	1245	2128	3002	7423
2215	980	1580	1580	1980	370	717	844	1216	541	1041	1411	1878
2216	4452	7352	7952	8552	1683	3338	4246	5251	1944	3954	5292	6475
2217	392	5792	16092	16892	148	2630	8593	10372	256	2965	9525	11466
2218	137	137	8337	8337	52	62	4452	5119	115	138	4943	5681
2219	294	994	994	994	111	451	531	610	237	624	859	984
2220	392	792	792	792	148	360	423	486	355	619	725	832
2221	490	1690	1690	1690	185	767	902	1038	590	1285	1570	1873
2222	490	1690	2740	2740	185	767	1463	1682	797	1534	3655	4188
2223	2352	3152	3452	3452	889	1431	1843	2120	1429	2101	2637	3027
2224	2744	2744	3344	3344	1037	1246	1786	2053	1433	1721	2366	2715
2225	1960	1960	2460	3060	741	890	1314	1879	1128	1354	2637	3693
2226	1960	1960	3560	3560	741	890	1901	2186	957	1149	2569	2949
2227	39	39	9039	9039	15	18	4827	5550	33	256	5785	6788
2228	882	882	1782	11782	333	400	952	7234	450	756	1784	8703
2229	169	519	1619	3219	64	236	865	1976	289	517	1230	2466
2230	6704	7854	9304	9304	2534	3566	4968	5713	2660	3750	5233	6303
2231	3136	5336	5886	11386	1185	2423	3143	6991	1698	3103	4340	8849
2232	784	784	1684	3484	296	356	899	2139	728	874	1529	2931
2233	86	86	336	2836	33	39	179	1741	348	417	1011	3224
2234	1568	1568	3668	9068	593	712	1959	5568	593	712	2224	6144
2235	274	274	774	11174	104	124	413	6861	257	308	892	7883
2236	1254	1254	2554	3354	474	569	1364	2059	735	882	2032	2923
	76700	104000	164000	218000	28992	47217	87577	133852	40233	63894	116988	171650

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

THORNTON

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
2301	40	40	40	40	1800	2160	2520	2880	11	22	32	56	99	238	403	806
2302	50	98	98	98	2250	5292	6174	7056	13	27	37	57	117	292	466	821
2303	84	94	94	94	3780	5076	5922	6768	19	21	21	23	171	227	265	331
2304	33	53	53	53	1485	2862	3339	3816	21	26	26	26	189	291	328	374
2305	46	52	52	52	2070	2808	3276	3744	15	26	51	138	135	281	643	1987
2306	36	36	36	36	1620	1944	2268	2592	28	36	46	96	252	389	580	1382
2307	18	18	18	18	810	972	1134	1296	34	42	58	90	306	454	731	1296
2308	33	33	33	33	1485	1782	2079	2376	23	30	36	37	207	324	454	533
2309	52	52	52	52	2340	2808	3276	3744	25	40	50	62	225	432	630	893
2310	20	20	20	20	900	1080	1260	1440	28	31	31	136	252	335	391	1958
2311	18	18	18	18	810	972	1134	1296	25	47	67	87	225	508	844	1253
2312									21	52	105	145	189	562	1323	2088
2313									14	24	35	55	126	259	441	792
2314	5	5	5	5	225	270	315	360	19	21	28	28	171	227	353	403
2315	11	11	11	11	495	594	693	792	23	44	64	64	207	475	806	922
2316	18	18	18	18	810	972	1134	1296	24	46	66	76	216	497	832	1094
2317	25	37	37	37	1125	1998	2331	2664	25	25	25	33	225	270	315	475
2318	13	13	13	13	585	702	819	936	34	36	36	56	306	389	454	806
2319	9	9	9	9	405	486	567	648	34	54	54	89	306	583	680	1282
2320	18	56	56	56	810	3024	3528	4032	25	26	26	37	225	281	328	533
2321	13	169	169	169	585	9126	10647	12168	21	41	61	61	189	443	769	878
2322	8	14	14	14	360	756	882	1008	27	47	79	81	243	508	995	1166
2323	4	4	4	4	180	216	252	288	14	24	62	62	126	259	781	893
2324									9	59	109	210	81	637	1373	3024
2325		19	18	18		972	1134	1296	10	20	40	52	90	216	504	749
2326	2	2	2	2	90	108	126	144	11	11	11	12	99	119	139	173
2327	4	4	4	4	180	216	252	288	13	13	13	28	117	140	164	403
2328	8	63	63	63	360	3402	3969	4536	19	19	19	19	171	205	239	274
2329	13	68	68	68	585	3672	4284	4896	26	29	59	145	234	313	743	2088
2330	8	8	8	8	360	432	504	576	25	25	25	34	225	270	315	490
2331	7	7	7	7	315	378	441	504	15	20	26	28	135	216	328	403
2332	8	98	98	98	360	5292	6174	7056	26	49	64	64	234	529	806	922
2333	4	4	4	4	180	216	252	288	17	32	47	47	153	346	592	677
2334									7	7	7	8	63	76	88	115
2335									9	9	9	9	81	97	113	130
2336									12	22	34	54	108	238	429	778
2305	44	44	44	44	1980	2376	2772	3168	34	34	49	84	306	367	617	1210
2306		31	31	31		1674	1953	2232	24	26	26	30	216	281	328	432
2307	7	18	18	18	315	972	1134	1296	31	41	55	95	279	443	693	1368
2308	100	106	106	106	4500	5724	6678	7632	42	44	46	46	378	475	580	662
2317									25	29	29	29	225	313	365	418
2318									20	20	21	21	180	216	265	302
2319	46	46	46	46	2070	2484	2898	3312	8	109	109	109	72	1177	1373	1570
2320									9	11	11	11	81	119	139	158
2329									19	22	22	22	171	238	277	317
2330	50	90	90	90	2250	4860	5670	6480	15	55	85	115	135	594	1071	1656
2331	15	15	15	15	675	810	945	1080	20	22	35	36	180	238	441	518
2332	11	11	11	11	495	594	693	792	30	40	47	47	270	432	592	677
	881	1483	1483	1483	39645	80082	93429	106776	999	1556	2094	2950	8991	16809	26385	42480

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

THORNTON

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
2301	874	1074	1074	2674	330	488	574	1642	2229	2886	3497	5328
2302	4934	6284	6284	6284	1865	2853	3356	3858	4232	8437	9996	11735
2303	4164	4814	4814	5814	1574	2186	2571	3570	5525	7489	8758	10669
2304	8923	10773	10773	10773	3373	4891	5753	6615	5047	8034	9420	10805
2305	1239	3039	3039	3039	468	1380	1623	1866	2673	4469	5542	7597
2306	2123	5323	5323	5323	802	2417	2842	3268	2674	4750	5690	7242
2307	1475	2675	2925	5575	558	1214	1562	3423	1674	2640	3427	6015
2308	6785	9569	11585	11935	2565	4344	6186	7328	4257	6450	8719	10237
2309	6888	8688	8688	8688	2604	3944	4639	5334	5169	7184	8545	9971
2310	5037	6037	6037	8037	1904	2741	3224	4935	3056	4156	4875	8333
2311	5182	5872	5982	5982	1959	2666	3194	3673	2994	4146	5172	6222
2312	2344	2639	7644	7644	886	1198	4082	4693	1075	1760	5405	6781
2313	771	771	1171	1171	291	350	625	719	417	609	1066	1511
2314	5696	6386	8896	9096	2153	2899	4750	5585	2549	3396	5418	6348
2315	4708	5199	5358	5358	1780	2360	2861	3290	2482	3429	4360	5004
2316	3649	4649	4649	8149	1379	2111	2483	5003	2405	3580	4449	7393
2317	4935	5035	5035	7885	1865	2286	2689	4841	3215	4554	5335	7980
2318	1182	1732	1732	9282	447	786	925	5699	1338	1877	2198	7441
2319	1974	1974	1974	14974	746	896	1054	9194	1457	1965	2301	11124
2320	4441	4841	4841	8841	1679	2198	2585	5428	2714	5503	6441	9993
2321	3248	3348	3348	3348	1228	1520	1788	2056	2002	11089	13204	15102
2322	3907	3907	8107	9032	1477	1774	4329	5546	2080	3038	6206	7720
2323	4482	4482	13232	13332	1694	2035	7066	8186	2000	2510	8099	9367
2324	52	52	52	552	20	24	28	339	101	661	1401	3363
2325	884	884	884	1584	334	401	472	973	424	1589	2110	3018
2326	51	51	51	551	19	23	27	338	208	250	292	655
2327	3495	3495	3495	9120	1321	1587	1866	5600	1618	1943	2282	6291
2328	103	103	103	103	39	47	55	[illegible]	570	3654	4263	4873
2329	6312	7612	7612	7812	2386	3456	4065	4797	3205	7441	9092	11781
2330	5387	5387	5387	8687	2036	2440	2877	5334	2621	3148	3696	5400
2331	10742	12892	12892	12892	4060	5853	6884	7916	4510	6447	7653	8823
2332	11827	12877	12827	12827	4471	5846	6850	7876	5065	11667	13830	15854
2333	26	26	26	126	10	12	14	77	343	574	858	1042
2334	1799	1799	1799	2249	680	817	961	1381	743	893	1049	1496
2335	257	257	257	257	97	117	137	158	178	214	250	288
2336	2878	2878	3578	3578	1088	1307	1911	2197	1196	1545	2339	2975
2305	2056	2056	2056	2056	777	933	1098	1262	3063	3676	4487	5640
2306	370	1170	1170	2770	140	531	625	1701	356	2486	2906	4365
2307	2703	2703	4303	4303	1022	1227	2298	2642	1616	2642	4125	5306
2308	4770	5670	6420	6420	1803	2574	3428	3942	6681	8773	10686	12236
2317	3706	5206	5206	5206	1401	2364	2780	3196	1626	2677	3145	3614
2318	524	524	924	924	198	238	493	567	378	454	758	869
2319	1671	1771	1771	1771	632	804	946	1087	2774	4165	5217	5969
2320	1419	2219	2219	2219	536	1007	1185	1362	617	1126	1324	1520
2329	421	1321	1321	1321	159	600	705	811	330	838	982	1128
2330	6456	6456	6456	6456	2440	2931	3448	3964	4825	8305	10189	12100
2331	10280	10780	12080	12380	3886	4894	6451	7601	4741	5942	7837	9199
2332	1850	3200	3600	3600	699	1453	1922	2210	1464	2479	3207	3679
	169000	200500	229000	282000	63881	91029	122287	173146	112517	187920	242101	322402

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

RICH

	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
2401									40	50	72	105	360	540	907	1512
2402									6	16	27	63	54	173	340	907
2403									4	5	15	30	36	54	189	432
2404									23	23	31	91	207	248	391	1310
2405									4	4	4	4	36	43	50	58
2406									2	2	2	2	18	22	25	29
2407																
2408																
2409											10	30			126	432
2410												4				58
2411									2	2	2	8	18	22	25	115
2412	3	6	9	12	135	324	567	864	22	33	55	95	198	356	693	1368
2413									12	21	24	25	108	227	302	360
2414									37	54	74	126	333	583	932	1814
2415									8	18	33	60	72	194	416	864
2416									4	9	19	54	36	97	239	778
2417																
2418																
2419																
2420											2	2			25	29
2421		20	40	65		1080	2520	4680	8	20	36	71	72	216	454	1022
2422	4	8	12	16	180	432	756	1152	39	53	70	85	351	572	882	1224
2423									41	56	66	101	369	605	832	1454
2424									66	77	90	115	594	832	1134	1656
2425	20	50	80	90	900	2700	5040	6480	40	50	70	70	360	540	882	1008
2426	20	50	80	110	900	2700	5040	7920	16	27	39	72	144	292	491	1037
2427		15	30	45		810	1890	3240	12	18	28	68	108	194	353	979
2428		19	42	70		1026	2646	5040	6	11	27	62	54	119	340	893
2429	11	22	33	44	495	1188	2079	3168		1	2	2		11	25	29
2430												1				14
2431										1	1	1		11	13	14
2432																
2433									4	9	24	83	36	97	302	1195
2434									7	13	43	149	63	140	542	2146
2435	12	24	36	48	540	1296	2268	3456	33	44	56	86	297	475	706	1238
2436									79	90	111	111	711	972	1399	1598
	70	214	362	500	3150	11556	22806	36000	515	707	1033	1776	4635	7635	13015	25573

RICH

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

ZONE	POPULATION 1965	1975	1985	1995	RESIDENTIAL REFUSE TONS PER YEAR 1965	1975	1985	1995	TOTAL REFUSE TONS PER YEAR 1965	1975	1985	1995
2401	4855	5055	5755	6755	1835	2295	3073	4148	2195	2835	3980	5660
2402	362	362	562	9937	137	164	300	6101	191	337	640	7008
2403	4362	4462	4462	6412	1649	2026	2383	3937	1685	2080	2572	4369
2404	143	143	2643	2843	54	65	1411	1746	261	313	1802	3056
2405	49	49	49	49	19	22	26	30	55	65	76	88
2406	49	49	49	49	19	22	26	30	37	44	51	59
2407	44	44	44	44	17	20	23	27	17	20	23	27
2408	44	44	44	44	17	20	23	27	17	20	23	27
2409	33	33	108	108	12	15	58	66	12	15	184	498
2410	28	28	153	1247	11	13	82	766	11	13	82	824
2411	1781	1881	1881	3756	673	854	1004	2306	691	876	1029	2421
2412	1452	1652	2452	2452	549	750	1309	1506	882	1430	2569	3738
2413	329	3454	4704	4804	124	1568	2512	2950	232	1795	2814	3310
2414	828	3328	3328	3953	313	1511	1777	2427	646	2094	2709	4241
2415	1601	1601	1601	4257	605	727	855	2614	677	921	1271	3478
2416	44	44	44	1684	17	20	23	1034	53	117	262	1812
2417	49	49	49	128	19	22	26	79	19	22	26	79
2418	39	39	39	39	15	18	21	24	15	18	21	24
2419	44	44	44	44	17	20	23	27	17	20	23	27
2420	1474	1474	2199	2277	557	669	1174	1398	557	669	1199	1427
2421	66	2566	4441	4619	25	1165	2371	2836	97	2461	5345	8538
2422	636	1974	4474	4474	240	896	2389	2747	771	1900	4027	5123
2423	2165	3615	3615	3765	818	1641	1930	2312	1187	2246	2762	3766
2424	4800	6875	8125	8175	1814	3121	4339	5019	2408	3953	5473	6675
2425	1014	1114	1114	1114	383	506	595	684	1643	3746	6517	8172
2426	3195	3607	4207	4207	1208	1638	2247	2583	2252	4630	7778	11540
2427	120	520	520	3965	45	236	278	2435	153	1240	2521	6654
2428	39	39	2226	3781	15	18	1189	2322	69	1163	4175	8255
2429	17	317	630	630	6	144	336	387	501	1343	2440	3584
2430	17	117	117	417	6	53	62	256	6	53	62	270
2431	39	214	214	214	15	97	114	131	15	108	127	145
2432	44	169	169	169	17	77	90	104	17	77	90	104
2433	71	71	71	10071	27	32	38	6184	63	129	340	7379
2434	274	874	5874	6474	104	397	3137	3975	167	537	3679	6121
2435	4675	5075	5675	5675	1767	2304	3030	3484	2604	4075	6004	8178
2436	6718	6918	7418	7418	2539	3141	3961	4555	3250	4113	5360	6153
	41500	57900	79100	116050	15688	26287	42235	71257	23473	45478	78056	132830

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

BLOOM	INDUSTRIAL LAND USE ACRE				INDUSTRIAL REFUSE TONS PER YEAR				COMMERCIAL LAND USE ACRE				COMMERCIAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
2501									2	2	2	2	18	22	25	29
2502									3	3	3	3	27	32	38	43
2503									5	8	11	14	45	86	139	202
2504									15	15	15	15	135	162	189	216
2505									27	56	101	120	243	605	1273	1728
2506	22	44	66	92	990	2376	4158	6624	33	33	33	35	297	356	416	504
2507									16	26	36	46	144	281	454	662
2508									28	43	65	67	252	464	819	965
2509	17	44	71	102	765	2376	4473	7344	15	20	30	91	135	216	378	1310
2510									3	4	7	34	27	43	88	490
2511									2	29	34	49	18	313	428	706
2512										23	29	34		248	365	490
2513									8	20	43	63	72	216	542	907
2514									7	16	26	36	63	173	328	518
2515	56	358	660	967	2520	19332	41580	69624	6	21	26	26	54	227	328	374
2516	112	224	336	452	5040	12096	21168	32544	30	45	55	75	270	486	693	1080
2517									54	74	104	121	486	799	1310	1742
2518									33	43	53	84	297	464	668	1210
2519	5	10	15	20	225	540	945	1440	50	55	65	70	450	594	819	1008
2520									82	82	82	82	738	886	1033	1181
2521	224	463	702	945	10080	25002	44226	68040	44	44	44	44	396	475	554	634
2522	234	677	1120	1573	10530	36558	70560	13256	8	22	35	50	72	238	441	720
2523		50	100	154		2700	6300	11088	12	13	23	53	108	140	290	763
2524		151	302	457		8154	19026	32904	15	45	87	137	135	486	1096	1973
2525									12	12	22	34	108	130	277	490
2526		56	112	172		3024	7056	12384	9	9	27	37	81	97	340	533
2527	50	261	472	688	2250	14094	29736	49536	6	18	30	35	54	194	378	504
2528	94	168	252	341	3780	9072	15876	24552	30	35	40	45	270	378	504	648
2529	84	168	252	341	3780	9072	15876	24552	54	54	55	55	486	583	693	792
2530									61	61	61	81	549	659	769	1166
2531									25	25	25	45	225	270	315	648
2532	5	10	15	20	225	540	945	1440	28	38	61	101	252	410	769	1454
2533	22	79	136	196	990	4266	8568	14112	16	31	36	50	144	335	454	720
2534									4	9	18	31	36	97	227	446
2535									6	6	19	37	54	65	239	533
2536									9	9	9	15	81	97	113	216
2505									13	13	13	13	117	140	164	187
2506									7	7	7	7	63	76	88	101
2507									2	2	2	2	18	22	25	29
2508									5	5	5	5	45	54	63	72
2517									5	5	5	5	45	54	63	72
2518	2	4	6	8	90	216	378	576	9	9	9	9	81	97	113	130
2519		166	332	502		8964	20916	36144	11	11	11	11	99	119	139	158
2520									6	6	6	6	54	65	76	86
2529	4	8	12	16	180	432	756	1152	3	3	3	3	27	32	38	43
2530									8	8	8	8	72	86	101	115
2531									5	5	5	6	45	54	63	86
2532																
	921	2941	4961	7046	41445	158814	312543	407312	832	1123	1486	1992	7488	12126	18725	28694
TOTALS SUBURBAN COOK CO.	10351	15403	19004	22680	455795	831762	1197252	1532960	18805	24854	32017	39784	169245	268428	403427	572876

BLOOM

POPULATION AND REFUSE PROJECTIONS FOR SUBURBAN COOK COUNTY

	POPULATION				RESIDENTIAL REFUSE TONS PER YEAR				TOTAL REFUSE TONS PER YEAR			
ZONE	1965	1975	1985	1995	1965	1975	1985	1995	1965	1975	1985	1995
2501	43	43	43	43	16	20	23	26	34	42	48	55
2502	16	16	16	16	6	7	9	10	33	39	47	53
2503	389	389	389	389	147	177	208	239	192	263	347	441
2504	1200	1200	1200	1200	454	545	641	737	589	707	830	953
2505	3598	8598	17348	23998	1360	3903	9264	14735	1603	4508	10537	16463
2506	9173	9173	9173	9773	3467	4165	4898	6001	4754	6897	9472	13129
2507	1216	1216	1216	1216	460	552	649	747	604	833	1103	1409
2508	4105	4205	6705	7330	1552	1909	3580	4501	1804	2373	4399	5466
2509	203	203	203	5823	77	92	108	3578	977	2684	4959	12232
2510	219	531	531	9281	83	241	284	5699	110	284	372	6189
2511	166	2353	2353	2353	63	1068	1257	1445	81	1381	1685	2151
2512	246	1339	1808	1808	93	608	965	1110	93	856	1330	1600
2513	86	868	1806	1806	33	394	964	1109	105	610	1506	2016
2514	203	3429	3429	3429	77	1557	1831	2105	140	1730	2159	2623
2515	64	3501	3501	3501	24	1589	1870	2150	2598	21148	43778	72148
2516	1753	1753	1753	1753	663	796	936	1076	5973	13378	22797	34700
2517	5143	5143	5143	7643	1944	2335	2746	4693	2430	3134	4056	6435
2518	5016	5016	5016	8766	1896	2277	2679	5382	2193	2741	3347	6592
2519	2382	2382	2382	2382	900	1081	1272	1463	1575	2215	3036	3911
2520	9312	9312	9312	9312	3520	4228	4973	5718	4258	5114	6006	6899
2521	5266	5366	5366	5366	1991	2436	2865	3295	12467	27913	47645	71969
2522		1250	1250	1250		568	668	768	10602	37364	71669	14744
2523	4061	4474	4474	4474	1535	2031	2389	2747	1643	4871	8979	14598
2524	75	75	543	543	28	34	290	333	163	8674	20412	35210
2525	3539	3539	3639	4264	1338	1607	1943	2618	1446	1737	2220	3108
2526	192	192	3005	3005	73	87	1605	1845	154	3208	9001	14762
2527	208	2708	5208	5208	79	1229	2781	3198	2383	15517	32895	53238
2528	1839	1839	1839	1839	695	835	982	1129	4745	10285	17362	26329
2529	6513	6513	6825	6825	2462	2957	3645	4191	6728	12612	20214	29535
2530	4317	4317	4317	4317	1632	1960	2305	2651	2181	2619	3074	3817
2531	6556	6556	6556	6556	2478	2976	3501	4025	2703	3246	3816	4673
2532	4189	4189	5127	5127	1583	1902	2738	3148	2060	2952	4452	6042
2533	975	975	975	3675	369	443	521	2256	1503	5044	9543	17088
2534	384	384	1634	4547	145	174	873	2792	181	271	1100	3238
2535	64	64	1001	3813	24	29	535	2341	78	94	774	2874
2536	1194	1194	1194	3069	451	542	638	1884	532	639	751	2100
2505	735	735	735	735	278	334	392	451	395	474	556	638
2506	213	213	213	213	81	97	114	131	144	173	202	232
2507	149	149	149	149	56	68	80	91	74	90	105	120
2508	59	59	59	59	22	27	32	36	67	81	95	108
2517	122	122	122	122	46	55	65	75	91	109	128	147
2518	202	202	202	202	76	92	108	124	247	405	599	830
2519	112	112	112	112	42	51	60	69	141	9134	21115	36371
2520	192	192	192	192	73	87	103	118	127	152	179	204
2529	389	389	389	389	147	177	208	239	354	641	1002	1434
2530	74	74	74	74	28	34	40	45	100	120	141	160
2531	192	192	192	817	73	87	103	502	118	141	166	588
2532	256	256	256	256	97	116	137	157	97	116	137	157
	96600	107000	128975	169025	32737	48579	68878	103783	81670	219519	400146	539779
TOTALS SUBURBAN COOK CO.	1918400	2387400	2843925	3267375	725167	1083886	1518656	2006184	1[illegible]50207	2184076	3119335	4112020

APPENDIX B

STATE RULES AND REGULATIONS

State of Illinois

DEPARTMENT OF PUBLIC HEALTH

Division of Sanitary Engineering

RULES AND REGULATIONS
FOR
REFUSE DISPOSAL SITES
AND FACILITIES

April, 1966

4.716

FOREWORD

These rules and regulations are being promulgated by the Department of Public Health in accordance with the requirements of the Illinois Refuse Disposal Law. The Department wishes to acknowledge the invaluable assistance given by the Illinois Refuse Disposal Advisory Board in the development of the rules and their advice and counsel regarding the problems that are involved.

The facilities required by these rules and regulations could well be termed the target objectives; in other words, those facilities that we expect will be provided within a reasonable length of time. The policy the Department plans to follow, will permit, where proven necessary, a reasonable period of time for establishing adequate facilities, without compromising on the basic essentials which are necessary for the protection of health. These essentials include the protection of the ground and surface waters, the prevention of air pollution, the elimination of insect and rodent vectors, and the prevention of public nuisance conditions. These are basic in protecting the public's health.

We believe everyone will benefit by a sensible and practical administration of these rules and regulations, which are designed to protect the environment and thus the public health. Cooperation between this Department and the industry is necessary in an area where cooperation is not a mere sentiment but an economic necessity. If these rules and regulations accomplish this objective they will have served their intended purpose.

ACKNOWLEDGEMENTS

ILLINOIS REFUSE DISPOSAL ADVISORY BOARD

MR. WILLIS E. COLLINS
Addison Engineering Service Company

MR. SAMUEL M. CLARKE
Greeley and Hansen Engineers

MR. JOHN VANDERVELD, JR.
National Disposal Contractors, Inc.

MR. JOHN SEXTON
John Sexton Contractors Company

MR. J. A. DAVIS
City of Salem, Illinois

MR. PAUL A. LENZ*
City of Alton, Illinois

*Resigned from Advisory Board

TABLE OF CONTENTS

FOREWORD i
ACKNOWLEDGEMENTS ii
TABLE OF CONTENTS iii
PROMULGATION iv
ARTICLE I. REGISTRATION 1
  Rule 1.01 Registration 1
  Rule 1.02 Notification of Change 1
  Rule 1.03 New Sites 1
ARTICLE II. SITE 1
  Rule 2.01 Location 1
  Rule 2.02 Flooding 1
  Rule 2.03 Access 2
ARTICLE III. DISPOSAL METHODS 2
  Rule 3.01 Sanitary Landfill 2
  Rule 3.02 Incineration 2
  Rule 3.03 Composting 2
  Rule 3.04 Open Dumping 2
  Rule 3.05 Open Burning 2
  Rule 3.06 Garbage Feeding to Swine 2
  Rule 3.07 Garbage Grinders 2
ARTICLE IV. SANITARY LANDFILL 3
  Rule 4.01 Planning 3
  Rule 4.02 Site Approval 3
  Rule 4.03 Site Improvement 4
  Rule 4.04 Fire Protection 4
ARTICLE V. SANITARY LANDFILL OPERATION 4
  Rule 5.01 General 4
  Rule 5.02 Site Access 5
  Rule 5.03 Dumping Area 5
  Rule 5.04 Unloading 5
  Rule 5.05 Equipment 5
  Rule 5.06 Spreading and Compacting of Refuse 5
  Rule 5.07 Cover 5
  Rule 5.08 Deposition of Liquids and Hazardous Materials 6
  Rule 5.09 Vector Control 6
  Rule 5.10 Salvage Operations 6
  Rule 5.11 Sanitary Landfill Variation 6
  Rule 5.12 Prohibited Activities 6
ARTICLE VI. ADMINISTRATION 7
  Rule 6.01 Administrative Review 7

STATE OF ILLINOIS)
) SS
COUNTY OF SANGAMON)

I, Franklin D. Yoder, M. D., Director of the Department of Public Health, State of Illinois, do hereby certify that the following rules have been promulgated in accordance with the Illinois Refuse Disposal Law, and shall be in full force and effect upon filing of same with the Secretary of State, State of Illinois.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Seal of the Department of Public Health to be affixed this 22nd. day of March, 1966.

Franklin D Yoder, M.D.

Franklin D. Yoder, M. D.
Director of Public Health

State of Illinois
Department of Public Health
Division of Sanitary Engineering

RULES AND REGULATIONS
FOR
REFUSE DISPOSAL SITES
AND FACILITIES

ARTICLE I

REGISTRATION

Rule 1.01. REGISTRATION. All refuse disposal sites or facilities shall be registered with the Illinois Department of Public Health on forms to be provided by the Department.

Rule 1.02. NOTIFICATION OF CHANGE. The Department shall be notified in writing at least 30 days prior to any proposed change in method of operation, deviation from the approved method of operation, relocation, or closure.

Rule 1.03. NEW SITES. After the effective date of these rules, prior approval shall be obtained from the Department for any new refuse disposal site or facility. Said approval will be granted when the registrant shall have met the rules as set forth herein.

ARTICLE II

SITE

Rule 2.01. LOCATION. All refuse disposal site locations shall conform to applicable State laws and county or municipal zoning laws and ordinances.

Rule 2.02. FLOODING. Sites subject to flooding should be avoided, if possible. Sites located in areas which may be subject to flooding shall be protected by impervious dikes. Pumping facilities shall be provided for removal of seepage and surface waters.

Rule 2.03. ACCESS. Access roads to the disposal site shall be of all-weather construction and negotiable at all times by trucks and other vehicles

ARTICLE III

DISPOSAL METHODS

Rule 3.01. SANITARY LANDFILL. Sanitary landfill operation shall be in accordance with Article IV.

Rule 3.02. INCINERATION. A permit shall be obtained from the Illinois Air Pollution Control Board prior to the construction of an incinerator.

(a) Incinerator operation shall be in accordance with the Rules and Regulations Governing the Control of Air Pollution.

(b) The site for, and method of residue disposal shall have prior approval of the Department.

Rule 3.03. COMPOSTING. Composting of refuse shall be done only with prior approval of the Department and in accordance with requirements prescribed in the approval document.

Rule 3.04. OPEN DUMPING. Open dumping is prohibited.

Rule 3.05. OPEN BURNING. Open burning is prohibited.

Rule 3.06. GARBAGE FEEDING TO SWINE. Garbage feeding to swine shall be done only with prior approval of the Department and in accordance with the requirements prescribed in the approval document, and in conformity with the Illinois Revised Statutes, 1965, Chapter 8, Sections 192 through 202.

Rule 3.07. GARBAGE GRINDERS. Municipal or industrial garbage grinding and disposal shall be done only with the prior approval of the Department and in accordance with requirements prescribed in the approval document.

ARTICLE IV

SANITARY LANDFILL

Rule 4.01. PLANNING. Each application for approval of a landfill site shall be accompanied by a description of the proposed operation, together with a topographic map or maps, which shall have scale and contour intervals that clearly show the character of the land. The map(s) shall be commensurate with the scope of the operation, location, and physical hazards involved. Depending upon an evaluation of these factors, the map(s) and accompanying data shall indicate any or all of the following items: Original and final surface contours; the proposed fill area; any borrow area; access roads; on-site roads; grades for proper drainage of each lift required and a typical cross-section of a lift; special drainage devices if necessary; fencing; structures on the site; existing and proposed utilities; and all other pertinent information to indicate clearly the soil characteristics, water table, orderly development, operation and completion of the sanitary landfill. A sanitary survey and a land use plan of the adjacent areas may be required.

Rule 4.02. SITE APPROVAL. Sanitary landfill sites shall conform with the general requirements contained in Article II. In addition, the following requirements shall apply:

(a) The sub-soil structure shall be such that there is reasonable assurance that leachate from the landfill will not contaminate the ground waters or streams in the area, or that suitable procedures to prevent such contamination will be followed.

(b) The surface contour of the area shall be such that surface run-off will not flow into or through the operational or completed fill area. Grading, diking, terracing, diversion ditches, or tiling may be approved when practical.

(c) Areas having high ground water tables may be restricted to landfill operations which will maintain a safe verticle distance between deposited refuse and the maximum water table elevation. Any operation which proposes to deposit refuse within or near the maximum water table elevation shall include corrective or preventive measures which will prevent contamination of the ground water stratum. Monitoring facilities may be required.

Rule 4.03. SITE IMPROVEMENT. The following physical improvements shall be made before a landfill site is placed in operation:

(a) The site shall be adequately fenced, with an entrance gate that can be locked, and posted. Opening and closing hours and days of operation shall be clearly shown.

(b) All-weather operational road(s) shall be provided for vehicular movement within the site. Separate operational areas may be operated within the site to allow for wet or dry weather operation and access. When necessary, to prevent dust nuisance, operational roads within the site shall be surfaced or treated.

(c) A shelter, convenient for use by operating personnel, shall be furnished. The shelter shall be screened and provided with heating facilities and adequate lighting. Provisions shall also be made for safe drinking water and sanitary hand-washing and toilet facilities.

Rule 4.04. FIRE PROTECTION. Arrangements shall be made for fire protection services when a fire protection district or other public fire protection service is available. When such a service is not available, practical alternate arrangements shall be made.

(a) Burning material, or any refuse at a temperature likely to cause fire shall not be deposited in the fill. Said material may be deposited in a separate location a sufficient distance from the fill to prevent fires from spreading to the normal fill area and shall be immediately covered with a sufficient amount of earth to extinguish same.

ARTICLE V

SANITARY LANDFILL OPERATION

Rule 5.01. GENERAL. All operation of the sanitary landfill shall be in accordance with the approved plan.

Rule 5.02. SITE ACCESS. Access to the site shall be permitted only during the hours when operating personnel are on the site.

Rule 5.03. DUMPING AREA. Dumping of refuse on the site shall be confined to the smallest practical area.

Rule 5.04. UNLOADING. Unloading shall be supervised. Portable fences shall be used when necessary to prevent blowing litter from the unloading site. The fill and surrounding area shall be policed as necessary to collect all scattered material.

Rule 5.05. EQUIPMENT. Sufficient equipment in operational condition shall be available at the site at all times to permit operation of the landfill according to the approved plan.

Rule 5.06. SPREADING AND COMPACTING OF REFUSE. As rapidly as refuse is admitted to the site, it shall be spread and compacted in shallow layers of approximately two to three feet in compacted depth depending upon the type of material and the compaction equipment. The completed cell shall consist of the refuse admitted and compacted during one working day, regardless of overall height and area covered.

Rule 5.07. COVER. Cover material shall be of such quality as to prevent fly and rodent attraction and breeding, blowing litter, release of odors, fire hazards, and unsightly appearance, and which will permit only minimal percolation of surface water when properly compacted. Cover shall be applied as follows:

(a) Daily Cover. A compacted layer of at least six (6) inches of material shall be used to cover all exposed refuse at the end of each working day; except that on surfaces that will not receive an additional depth of refuse or the final cover within 60 days, a compacted layer of cover of at least one (1) foot shall be applied.

(b) Final Cover. A compacted layer of at least two (2) feet of material in addition to the daily cover shall be placed over the entire surface of all completed portions of the fill within six (6) months following the final placement of refuse. Final cover shall be graded as provided on the approved plan and to prevent ponding. The surface of the final cover shall be maintained at the plan elevation at all times, by the placement of additional cover material where necessary.

Rule 5.08. DEPOSITION OF LIQUIDS AND HAZARDOUS MATERIALS. Sewage solids or liquids, septic tank pumpings, and other liquids or hazardous substances shall not be discharged to a sanitary landfill until written approval has been obtained from the Department. Special provisions may vary from site to site depending upon local conditions, and will be specified in the approval letter.

Rule 5.09. VECTOR CONTROL. Insect and rodent control measures shall be employed as directed by the Department.

Rule 5.10. SALVAGE OPERATIONS. Salvage operations are not recommended in conjunction with a sanitary landfill. In the event that salvage operations are carried out, the following conditions shall apply:

(a) All salvage operations shall be conducted in a sanitary manner.

(b) Salvage operations shall be confined to an area remote from the operating face of the fill.

(c) Salvage operations shall not interfere with, or otherwise delay the fill operation.

(d) All salvaged materials shall be removed from the landfill site daily, or properly stored such that they will not create a nuisance, rat harborage, or unsightly appearance.

Rule 5.11. SANITARY LANDFILL VARIATION. Large quantities of non-combustible and non-putrescible waste such as boiler-house cinders, broken paving, or materials resulting from construction or demolition operations may be disposed of at a sanitary landfill by open dumping. Such material shall be leveled and spread at sufficient intervals to prevent unsightly appearance or rodent harborage, and shall be finally covered as required for a completed sanitary landfill in Rule 5.07, unless approved plan provides for other cover.

Rule 5.12. PROHIBITED ACTIVITIES. The following activities shall be prohibited in conjunction with, or upon the site of the sanitary landfill.

(a) All scavenging operations. Scavenging shall mean the manual sorting of refuse, either in the trucks, at the face of the fill, or in unconfined truck discharge areas.

(b) All feeding of farm or domestic animals.

(c) Deposition of refuse in standing water.

(d) Burning, except in an approved incinerator under Rule 3.02.

ARTICLE VI

ADMINISTRATION

Rule 6.01. ADMINISTRATIVE REVIEW. All final administrative decisions of the Department hereunder shall be subject to judicial review pursuant to the provisions of the "Administrative Review Act" approved May 8, 1945 as amended and the rules adopted pursuant thereto.

ILLINOIS SANITARY WATER BOARD

Rules and Regulations SWB-8

Illinois River and Lower Section of Des Plaines River

AUTHORITY

Pursuant to the authority contained in Sec. 6, Paragraphs (b) and (f) of "An Act to establish a Sanitary Water Board and to control, prevent, and abate pollution of the streams, lakes, ponds, and other surface and underground waters in the State" (approved and in force July 12, 1951, Par. 145.6, Ch. 19, Ill. Rev. Stat. 1965), the Sanitary Water Board adopts the following Rules and Regulations.

STATEMENT OF POLICY

In the above Act, it has been declared to be the public policy of this State to maintain reasonable standards of purity of the waters of the State consistent with their use for domestic and industrial water supplies, for the propagation of wildlife, fish and aquatic life, and for domestic, agricultural, industrial, recreational and other legitimate uses, including their use in the final distribution of the water-borne wastes of our economy. It has also been declared to be the public policy of this State to provide that no waste be discharged into any waters of the State without first being given the degree of treatment necessary to prevent the pollution of such waters.

WATER QUALITY CRITERIA

ARTICLE I

Rule 1.01. Introduction

These criteria of water quality prescribe the qualities or properties of the waters of the State which are necessary for the designated public use or benefit, and which, if the limiting conditions given are exceeded, shall be considered indicative of a polluted condition subject to abatement.

These stream criteria shall be applicable to the Illinois River main stream, the DesPlaines River downstream from the confluence with the Chicago Sanitary and Ship Canal, and each tributary at its confluence with the main stream.

"Standard Methods for the Examination of Water and Waste Water", Twelfth Edition, 1965, American Public Health Association, Inc. should be employed where applicable, but it is recognized that other approved methods may be required in applying some of the criteria. The Illinois Sanitary Water Board shall designate the alternate procedure in "Standard Methods", *and approve any departure from these procedures, with the concurrence of the Federal Water Pollution Control Administration.*

EDITOR'S NOTE: Changes requested by U.S. Department of Interior are *italicized.*
Revised - 101766, 081167, 030568
DBM:mh

Rule 1.02 STREAM SECTORS *AND USES*

a) The Illinois River and the Des Plaines River downstream from the Chicago Sanitary and Ship Canal to the mouth of the Fox River is designated as an Industrial Water *Supply* Sector. Industrial Water *Supply* criteria shall apply.

b) The Illinois River from the mouth of the Fox River to the mouth of Bureau Creek is designated as an Aquatic Life Sector. Aquatic life criteria shall apply.

c) The Illinois River from the mouth of Bureau Creek to the Peoria and Pekin Union RR Bridge at Peoria is designated as an Aquatic Life, Recreational and Public Water Supply Sector. Aquatic, Recreational Criteria shall apply. The Public Water Supply Criteria shall apply at the point at which water is withdrawn for treatment and distribution as a potable supply.

d) The Illinois River from the Peoria and Pekin Union RR Bridge to the Mississippi River is designated as an Aquatic Life Sector. Aquatic life criteria shall apply.

Rule 1.03 MINIMUM CONDITIONS

These Minimum Criteria shall apply to all waters at all places and at all times in addition to specific criteria applicable to specific sectors.

• a) Free from substances attributable to municipal, industrial or other discharges that will settle to form putrescent or otherwise objectionable sludge deposits; or which will form bottom deposits that may be detrimental to bottom biota (such as coal fines, limestone dust, fly ash, etc.)

b)Free from floating debris, oil, scum and other floating materials attributable to municipal, industrial or other discharges in amounts sufficient to be unsightly or deleterious;

Oils, grease and floating solids shall be reduced to a point such that they will not create fire hazards, coat hulls of watercraft, injure fish or wildlife or their habitat, or will adversely affect public or private recreational development or other legitimate shoreline developments or uses.

c) Free from materials attributable to municipal, industrial or other discharges producing color, odor or other conditions in such degree as to create a nuisance;

d) Free from substances attributable to municipal, industrial or other discharges in concentrations or combinations which are toxic or harmful to human, animal, *plant* or aquatic life.

Rule 1.04 FOR PUBLIC WATER SUPPLY *and FOOD PROCESSING INDUSTRY*

The following criteria are for evaluation of river quality at the point at which water is withdrawn for treatment and distribution as a potable supply;

a) Bacteria: Coliform group not to exceed 5,000 per 100 ml as a monthly average value (either MPN or MF count); nor exceed this number in more than 20 per cent of the samples examined during any month; nor exceed 20,000 per 100 ml in more than five per cent of such samples.

b) Dissolved solids: Not to exceed 500 mg/l as a monthly average value, nor exceed 750 mg/l at any time. Values of specific conductance of 750 and 1025 micromhos/cm (at 25 deg. C.) may be considered equivalent to dissolved solid concentration of 500 to 750 mg/l.

c) Chemical Constituents: Not to exceed the following specific concentration at any time:

Stream Samples

Constituent	Concentration mg/l
Acidity (Total)	0.0
Ammonia Nitrogen (N)	2.5
*Arsenic	0.05
*Barium	1.0
*Cadmium	0.01
CCE (Carbon Chloroform Extract)	0.2
Chloride	150
*Chromium-Hexavalent (Chromate or dichromate)	0.05
*Chromium-Trivalent (Chromic or chromite)	1.00
*Copper	1.0
Cyanide	0.025
Fluoride	1.00
Iron (total)	0.3
*Lead	0.05
MBAS	0.5
Nitrate (as NO_3)-	45
Oil	Substantially free of visible floating oil
pH	6.0 - 9.0
Phenols	.02
Phosphate	4.0
*Selenium	0.01
*Silver	0.05
Sulphate	200
Temperature	90°F
*Zinc	5.0

*Heavy Metals

d) Radio active substances: Gross beta activity in the known absence of Strontium 90 and alpha omitters not to exceed 1,000 micromicro curies per liter at any time. *"Absence of" is defined as not more than 10 pico curies of Strontium 90 and 3 pico annies of alpha radiation.*

Rule 1.05 FOR AQUATIC LIFE SECTORS

The following criteria are for evaluation of conditions at any point in the river, except for areas immediately adjacent to outfalls. In such areas cognizance will be given to opportunities for the admixture of waste effluents with river water:

a) Dissolved oxygen:

For maintenance of well balanced Aquatic life habitats the dissolved oxygen content shall be not less than 5.0 mg/l during at least 16 hours of any 24-hour period, nor less than 4.0 mg/l at anytime.

b) pH:

No value below *6.0* nor greater than 9.0 at any time, and preferably between 6.5 and 8.5. Sampling shall be beyond 100 feet of an outfall sewer.

c) Temperature:

Not to exceed 90 deg. F. at any time during the months of *April* through November, and not to exceed *60* deg. F. at any time during the months of December to *April.*

d) Toxic substances:

Not to exceed one-tenth of the 48-hour median tolerance limit, for fish, except that other limiting concentrations may be used in specific cases. Chemical constituents listed below are not to exceed the specific concentration at any time at any point in aquatic sectors of the basin, except for areas immediately adjacent to outfalls:

Constituent	Concentration mg/1
Ammonia Nitrogen (N)	2.5
*Arsenic	1.0
*Barium	5.0
*Cadmium	0.05
*Chromium-Hexavalent	0.05
*Chromium-Trivalent	1.00
*Copper	0.04
Cyanide	0.025
Iron	1.00
*Lead	0.1
Phenols	0.2
*Silver	0.05
*Zinc	1.00

*Heavy Metals

e) Taste and Odor:

Waters shall be free of substances from other than natural origin which will result in impairment of taste, odor or other factors which would reduce the acceptability of fishes for human consumption.

Rule 1.06 FOR RECREATION SECTOR

The following criterion is for evaluation of conditions at any point in a recreation sector used for such water contact activities as swimming and water skiing:

Bacteria - Number per 100 ml by MT Fermentation or MF Techniques

Bacteria: As determined by multiple-tube fermentation or membrane filter procedures, and based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content of primary contact recreation waters shall not exceed a geometric mean of 200/100 ml, nor shall more than 10% of total samples during any 30-day period exceed 400/100 ml.

(Primary contact recreation is intended to include activities in which there is prolonged and intimate contact with the water involving considerable risk of ingesting water.)

Rule 1.07 FOR INDUSTRIAL WATER SUPPLY SECTOR

The following criteria are applicable to stream water at the point at which the water is withdrawn for use for industrial cooling and processing; and at any point in the industrial water use sector:

a) Dissolved Oxygen: Not less than 3.0 mg/1 during at least 16 hours of any 24-hour period, nor less than 2.0 mg/1 at any time.

b) pH: Not less than *6.0* nor greater than 9.0 at any time.

c) Temperature: Not to exceed 93 deg. F. at any time.

d) Dissolved Solids: Not to exceed 750 mg/1 as a monthly average value, nor exceed 1,000 mg/1 at any time.

e) All items of Minimum Conditions applicable to all waters at all places and at all times. (See Rule 1.03)

f) *Bacteria: The fecal coliform content of secondary contact recreation waters, as determined by either multiple-tube fermentation or membrane filter techniques, shall not exceed a geometric mean of 1,000/100 ml, nor shall they equal or exceed 2,000/100 ml in more than 10% of the samples.*

(This criterion is intended to provide for water uses customarily described as "secondary contact uses", including boating, fishing, and limited contact with water incident to shoreline activities, in which contact with the water is either incidental or accidental and the probability of ingesting appreciable quantities of water is minimal.)

Rule 1.08 *IMPLEMENTATION AND ENFORCEMENT PLAN*

1. The Illinois Sanitary Water Board, under the 1951 Sanitary Water Board Act as amended (Ch. 19, Par. 145.1 - 145.18, IRS 1965), has the responsibility to control and prevent pollution in the waters of this State exclusive of the area embraced by Metropolitan Sanitary District of Greater Chicago. Authority to adopt and enforce water quality standards within the Metropolitan Sanitary District is contained in the recently adopted HB 1177, 75th General Assembly.

2. The Board adopted the criteria, Rules and Regulations SWB-8, December 1, 1966 as standards of water quality for the waters of the Illinois River and the Des Plaines River downstream from the confluence with the Chicago Sanitary and Ship Canal and each tributary at its confluence with the main stream. All waters will be required to meet the standards for the appropriate public and industrial water supply, aquatic life, recreational and agricultural uses. *Compliance with these standards will enhance the quality of waters within these streams.*

   Waters whose existing quality is better than the established standards as of the date which such standards become effective will be maintained in their present high quality within the powers granted by the "Illinois" water pollution control statutes. Such waters will not be lowered in quality unless and until it has been affirmatively demonstrated to the Federal Water Pollution Control Administration that such change is justifiable as a result of necessary economic or social development and will not interfere with or become injurious to, any appropriate beneficial uses made of, or presently possible in, such waters.

3. *The minimum weekly flow, which occurs once in 10 years, will be used in applying the standards.* The Board plans to require compliance with the bacteriological standards for recreation during the recreational season of April through October inclusive. It is recognized that there are uncontrollable sources of bacterial pollution other than that of sewage treatment plant effluents.

4. *Drastic or sudden temperature changes will not be permitted. The Board will insist upon controlled changes in temperature not to exceed 2 deg. F. per hour, nor more than a 5 deg. cumulative change from natural water temperature.*

5. The Board collects samples bimonthly from various locations on streams in the Illinois River Basin. Monthly samples are collected from most of the Illinois River stations and weekly samples from one station during May through October. Additional stations are being added as needed and two electronic stations are programmed for the Fall of 1967.

6. Rules and Regulations, SWB 2, require the certification of waste treatment plant operators. The prompt and regular submission of monthly operational reports is required to enable evaluation of effluent quality. Certification and record of operation report submissions are recorded in a computer system to facilitate periodic data processing. The frequency of inspections of wastewater treatment plants by representatives of the Board have been increased and will be increased more to insure compliance with the standards.

7. *Secondary treatment* resulting in effluents ranging from 20 to 40 mg/1 five day BOD and 25 to 45 mg/1 suspended solids *must be provided by all municipalities, including disinfection of the effluent.*

8. *All industries will be required to provide a degree of treatment or control that is equivalent to that required of municipalities.* In some instances supplemental or advanced waste treatment in excess of secondary treatment may be necessary.

9. It is the plan of the Board that, where needed, the control of pollution caused by combined sewer overflow or storm flow bypassing at sewage treatment works be provided at the time of improvement or expansion of treatment works. The separation of combined sewers or special treatment works in some instances, *the reduction of nutrients* and provision of tertiary treatment should be accomplished, where deemed necessary, within the next ten years, *or as practical technical methods are developed.*

10. *Treatment Requirements and Effluent Criteria*

In order to establish a basis for treatment works design, municipal and industry representatives and consultants frequently inquire regarding the limits or effluent standards that must be met. The adoption of stream water quality criteria as required by the Federal Water Quality Act of 1965(PL 89-234 amendments to PL 84-660; 33 U.S.C. 466) emphasizes the need to relate stream quality to effluent quality and treatment requirements. The expressed goals established by this Act are to protect and upgrade water quality; any wastes amenable to treatment or control must receive the best practicable treatment or control prior to discharge into any interstate water. The same goals have been, and continue to be, basic under the Sanitary Water Board Act for all waters of Illinois. Both the Federal Law and the Illinois Act prohibit the use of any stream or portion thereof for the sole or principal purpose of transporting wastes.

a. All municipal or industrial facilities for treatment of deoxygenating waste shall provide at least secondary biological treatment, or advanced waste treatment, adequate to reduce the organic pollution load of the treatment works effluent at the final treatment structure in accordance with effluent guidelines in paragraph 11, below. A final treatment structure is considered the last point of access before discharge to waters of the State. Effluents shall meet all criteria expressed in Item b below.

b. All facilities for the treatment of sewage, industrial wastes, or other wastes shall provide for the following:

1) Substantially complete removal of settleable solids.

2) Removal of all floating debris, oil, grease, scum, or sludge solids.

3) Removal of color, odor, or turbidity to below obvious levels.

4) Removal of heavy metals, or of toxic and odor producing substances in accordance with the levels of constituents and properties determined by the Board.

c. Storage facilities for materials which are hazardous to health and welfare, and for oils, gases, fuels, or other materials capable of causing water pollution if accidentally discharged, shall be located so as to minimize or prevent any spillage or leakage that might result in water pollution. Structures and devices to contain spillage, such as catchment areas, relief vessels, or entrapment dikes, should be installed at existing facilities, shall be installed at all new facilities, and shall be required following any discharge resulting in pollution.

11. *Guidelines Regarding Range of Treatment*

a. Secondary treatment resulting in effluents ranging from 20 to 40 mg/1 five-day BOD and 25 to 45 mg/1 suspended solids is acceptable on the Illinois River and lower Des Plaines River. Tertiary or other advance treatment or modifications of conventional treatment will be specified for all intermittent streams and small or low flow streams, and shall include effluent disinfection at least through the recreational season of April through October.

b. Permissive Treatment & Effluent Requirements
Based on Average Strength Municipal Wastes

Type Treatment	BOD or ODI Reduction Percent	Effluent BOD, ODI mg/1	Effluent Suspended Solids mg/1	Type Facilities	Stream Dilution Requirements
Secondary	85	30	35	Trickling Filter	Illinois and Des Plaines
Secondary	90	20	25	*Activated Sludge	2 to 1
Tertiary	95	10	13	Secondary plus Supplemental	1 to 1

*(or trickling filter & supplemental treatment)

Disinfection with up to 1mg/1 of chlorine residual in the effluent to reduce fecal Coliform to 400 or less, where necessary *for primary contact waters or to 2000 or less for secondary contact waters.*

Bypass flows in excess of waste treatment works capacity shall be given primary treatment, and chlorination if necessary, in auxiliary facilities.

c. Within design limitations, operation shall be of such quality to obtain the best possible degree of treatment from all treatment works. Every effort must be made to eliminate all system bypasses and overflows, otherwise measures must be taken to provide treatment units such as lagoons, detention or holding basins, and chlorination. Installation of new combined sewers are prohibited. Existing combined sewer systems should be patrolled; overflow regulating devices shall be adjusted to convey the maximum practicable amount of combined flow to treatment facilities. Excess infiltration into the sewer system should be eliminated to keep dry weather flow within design limits of conduits and treatment works.

12. *The Board will follow Typical Project Completion Schedules listed below:*

a. Chlorination Facilities

1) Completion of plans and specifications - 12 months before completion date.

2) Award of construction contracts - 6 months before completion date.

b. Treatment Works - Municipalities less than 10,000 Population and Industries

1) Completion of plans and specifications - 18 months before completion date.

2) Award of construction contracts - 12 months before completion date.

c. Treatment Works - Municipalities above 10,000 Population

1) Completion of plans and specifications - 30-33 months before completion date.

2) Award of construction contracts - 21-24 months before completion date.

13. If it appears at any time prior to the above dates that there will not be compliance with the timetables, the Board will hold administrative hearings and issue orders to submit schedule for abatement of pollution with a minimum time for completion of waste treatment facilities. When a waste producer fails to comply with an order, the Board will initiate legal action through the Attorney General for enforcement of the order in the appropriate court.

14. The Board will require and has scheduled construction of municipal treatment works improvements *in accordance with the timetable,* pages pages 9 to 11.

15. All industries with effluent discharge will be required to construct additional or improved treatment works *in accordance with the timetable,* pages pages 12 to 15.

EDITOR'S NOTE: Effective Date and Sanitary Water Board Certification on Page 16.

APPENDIX C

DATA ON INVESTIGATED SITES FOR A SOLID WASTE MOUNTAIN AND RECREATION AREA IN SOUTHWEST COOK COUNTY

The following is the basic data considered in selecting and evaluating investigated sites for a solid waste mountain and recreation area. Matters common to two or more sites are discussed under a number of topic headings relating to site suitability. Detail information peculiar to the individual sites is presented under the same headings in a tabulation following the general discussion.

SIZE AND CONFIGURATION

Each of the investigated sites has an area in excess of 3,200 acres. Sites 1, 4, and 5 each exceed 5 square miles while Sites 2 and 3 each encompass an area of approximately 6 square miles. Each site exceeds 3 miles in length; however, their width and configuration vary. Sites 1 and 4 both average approximately 1.5 miles in width. Site 2 is 1.25 miles wide at its north boundary and 3 miles wide at its south boundary. Site 3 is 2 miles in width. Site 5 averages approximately 1.8 miles in width. The two larger sites (2 and 3) would permit greater design flexibility for the proposed solid waste mountain and recreation facilities.

Depending upon permissible landfill side slopes, site width may limit the maximum height of fill on some sites to less than 1,000 feet. For example, an average side slope of 4 to 1 on a 1,000-foot high fill would require a base width of 8,000 feet. Such a fill could not be placed on Sites 1 or 4 as they are only 8,000 feet wide and some setback of the fill would be necessary.

EXISTING STRUCTURES ON SITES

All of the investigated sites are located in rural Cook County. Site 1 embraces about 200 single family residences (including farm homes) and 7 non-residential structures. Approximately half of these structures are sub-standard. No attempt was made to catalogue the number of farm accessory buildings on any of the sites. Site 2 includes only about 100 single family residences and 2 non-residential structures. With both Westhaven and Fernway Park located within its boundaries, Site 3 encompasses more structures than all the other sites combined. Approximately 510 single family residences and 6 non-residential structures are located within Site 3. The majority of these structures are sub-standard. Site 4 has the fewest structures with only 35 single family residences and 2 non-residential structures. Site 5 has 118 single family structures and 6 non-residential uses.

None of the sites has extensive commercial or industrial usage. A few scattered public buildings are located on all the sites. Sites 2, 4, and 5 contain cemeteries; however, these are not extensively developed at this time and should not create insurmountable difficulties. Site 5 encompasses 5 major public uses: 2 country clubs, a home for the aged, a scout camp, and a cemetery.

Site 3 contains 2 schools: The Fernway School and the Hollstein School. Site 2 also contains 2 schools. Sites 1, 4, and 5 contain no schools.

All of the sites are traversed by utilities, principally gas and oil pipelines and high voltage power transmission lines. In most instances, these utilities would have to be rerouted around the site.

Major streets traverse all the sites. The ultimate design for the completed landfill will determine which streets would have to be entirely eliminated and which would be rerouted to serve local traffic.

LAND VALUE

Approximate land value information indicates that most of the undeveloped land in the investigated sites is currently valued in the range of $3,000 to $4,500 per acre. Small areas of residential and commercial development are valued considerably higher and will significantly affect the overall land cost of the different sites.

ACCESSIBILITY

The distance and accessibility of the disposal site from areas of solid waste generation are major factors in the overall cost of solid waste disposal. Character of highway haul routes largely determines whether the hauling operation will create a nuisance. Fortunately, Sites 2, 3 and 4 now have excellent access via the interstate highway system. The same highways provide haul routes to Site 1, but several miles of undesirable travel on two-lane highways would be required to reach the site from the interstate system. Proposed express highways may provide excellent access to Site 1 in the future. The proposed South Suburban Freeway may bisect Site 5 when it is constructed.

Sites 1 and 2 have direct access to the Wabash Railroad and Site 3 has direct access to the Chicago, Rock Island and Pacific Railroad. Site 4 is ½ mile north of rail and Site 5 has rail access within ¼ mile. Subsequent transportation studies will determine whether railroads will be a feasible means for delivering solid wastes to the disposal sites.

All of the sites are several miles from water transportation routes except Site 5 which has access to the Calumet Sag Channel and the Chicago Sanitary and Ship Canal.

The sites are 15 to 20 miles from the initial stage of the proposed deep tunnel project, via the interstate highway system.

Passenger transportation by rail to the solid waste mountain and recreation area would be beneficial in making the recreation facilities available to the maximum number of people. Under the C.A.T.S. "Alternate Transit Network" the Wabash Railroad, which has direct access to Sites 1 and 2, would be a commuter railroad. However, under the C.A.T.S. "Recommended Transit System", no passenger service via rail would be available to Sites 1, 2, 4, or 5. Site 3 would be served by a local railroad under the C.A.T.S. "Recommended Transit System".

RELATIONSHIP TO OTHER LAND USES

All of the investigated sites are located within the Metropolitan Sanitary District of Greater Chicago. Site 4 includes one of the District's proposed sludge disposal sites.

Site 1 abuts existing Forest Preserves on both the north and the east. Site 2 includes 1.5 square miles of undeveloped Forest Preserve ground. Site 3 abuts this same area. Site 4 includes approximately one square mile of undeveloped Forest Preserve ground in its northeast corner. The Forest Preserve properties included in Sites 2 and 4 are necessary to provide sites of adequate size and suitable shape. Site 5 abuts Forest Preserve holdings along its east boundary.

Site 1 contains considerable residential development and its east side borders the Village of Orland Park. Site 3 contains the Fernway Park and Westhaven residential developments. Site 4 abuts the west side of the Village of Matteson. Site 5 is adjacent to the Village of Lemont. Site 2 is the least exposed to existing urban development. Residents of the sites and of the adjoining villages will probably strongly oppose the solid waste mountain.

Sites 1, 4 and 5 would be the most compatible with the proposed NIPC Finger Concept of urban development, as they are in proposed buffer wedges between development corridors. Sites 2 and 3 are in the proposed development corridors and would not be compatible with the Finger Concept.

WATER POLLUTION POTENTIAL

All sites are underlain by a creviced dolomite aquifer, and over a major part of all sites except Sites 3 and 5 a sand and gravel aquifer overlies the dolomite. These aquifers are a valuable natural resource and should be protected from pollutants which might leach from a solid waste landfill.

It is probable that reasonable protection of the aquifers would be provided by the approximately 50 to 150 feet of relatively impervious glacial till which extends from the ground surface to the top of the aquifers. Some glacial till would probably be used for cover on the refuse fill reducing the amount available for protection of the aquifers. Collection and treatment of leachate from the solid waste fill would also probably be necessary to control pollution of both ground water and surface water.

The preceding evaluation is based primarily on generalized information contained in publications of the Illinois State Geological Survey and State Water Survey. Subsurface drilling and investigations will be required to more definitely evaluate the water pollution potential of the sites. It may be possible to limit such detailed investigations to one or two sites selected on the basis of other factors.

DRAINAGE

Where possible, sites were selected in the upper portion of watersheds to minimize the amount of runoff to be diverted around the refuse fill. Ownership of all drainage area tributary to a site would be advantageous as this would permit filling in a manner to facilitate drainage.

All sites are considered suitable from the standpoint of drainage. However, some sites will be more difficult to drain than others.

FOUNDATIONS

Soil borings and other subsurface investigations will be required to determine whether the subsurface formations will adequately support a 1,000-foot high solid waste mountain, and the structural design parameters for the solid waste fill.

Since each of the sites is underlain by substantial depths of glacial till, formation conditions on all of the sites are expected to be similar except for variation in depth of till. The load bearing capacity of the subsurface formations may control the maximum slope of solid waste fill which, in turn, could limit the maximum height of fill.

It may be possible to limit subsurface investigations to one or two sites selected on the basis of other factors.

OBSTRUCTION TO AIR TRAFFIC

A Federal Aviation Administration representative advises that: (1) a 1,000-foot high structure anywhere within 40 miles of O'Hare Airport would be considered an obstruction to Instrument Flight Rules (IFR) navigation, (2) structures 500 feet in height and higher within 2 miles of a major highway, river or other prominent topographic feature would be considered an obstruction to Visual Flight Rules (VFR) navigation, (3) the FAA has successfully blocked installation of some radio and television antennas in the Chicago area which would have interfered with air traffic, and (4) if a proposed obstructing structure were essential for the public welfare, the FAA might accept it and adjust operating procedures accordingly.

All of the sites are within 30 airline miles of O'Hare Airport and within 2 miles of existing highways or proposed express highways; therefore, a 1,000-foot high structure would probably be considered by the FAA to be an obstruction to both IFR and VFR navigation.

Inquiry has been made to the Aviation Department of the City of Chicago as to whether a 1,000-foot high mountain on any of the potential sites would be compatible with the City's long-range aviation program. A reply had not been received when this was written.

MAPS AND SITE DETAILS

Attached are a detailed tabulation of evaluation data for each of the 5 sites, a tabulation of the advantages and disadvantages of each site, a site location map and maps of each of the sites.

SITE 1

Advantages

1. Sparsely developed.
2. Would complement adjacent Forest Preserve.
3. In NIPC Open Space Wedge.
4. Direct rail access.
5. Partially screened by Forest Preserve and industrial area.
6. Minimum water pollution potential.

Disadvantages

1. No freeway access now.
2. Two future freeways may cross site.
3. In NIPC Environmental Scenic District.
4. Many ownerships.
5. No access to water transportation.
6. Shape limits development possibilities.
7. Rerouting of major streets.

SITE 2

Advantages

1. Sparsely developed.
2. Large ownerships.
3. Good freeway access.
4. Direct rail access.
5. Shape favorable for design.
6. Slight utility conflict (most need not be moved).
7. Lower comparative site cost.

Disadvantages

1. In NIPC Development Corridor.
2. Includes existing Forest Preserve land.
3. No access to water transportation.

SITE 3

Advantages

1. Good freeway access.
2. Direct rail access.
3. Shape favorable for design.

Disadvantages

1. In NIPC Development Corridor.
2. Extensive residential development.
3. Extensive utility conflict.
4. No water access.
5. Relatively high site cost.
6. Many ownerships.

SITE 4

Advantages

1. Sparsely developed.
2. Large ownerships.
3. In NIPC Open Space Wedge.
4. Good freeway access.
5. Slight utility conflict.
6. Slight street rerouting.
7. Relatively low site cost.

Disadvantages

1. Includes existing Forest Preserve.
2. No water access.
3. Least protection of aquifer.
4. Indirect rail access.

SITE 5

Advantages

1. Water access.
2. Rail access.
3. Minimum water pollution potential.
4. Shape favorable for design.
5. Offers transportation flexibility.
6. Partially in NIPC Open Space Wedge.
7. Partially screened by Forest Preserve and Cal Sag Channel.

Disadvantages

1. No existing freeway access.
2. Future N-S freeway may cross site.
3. Large semi-public and public land uses.
4. Extensive utility conflict.
5. Relatively high site cost.
6. Extensive rerouting of highways.

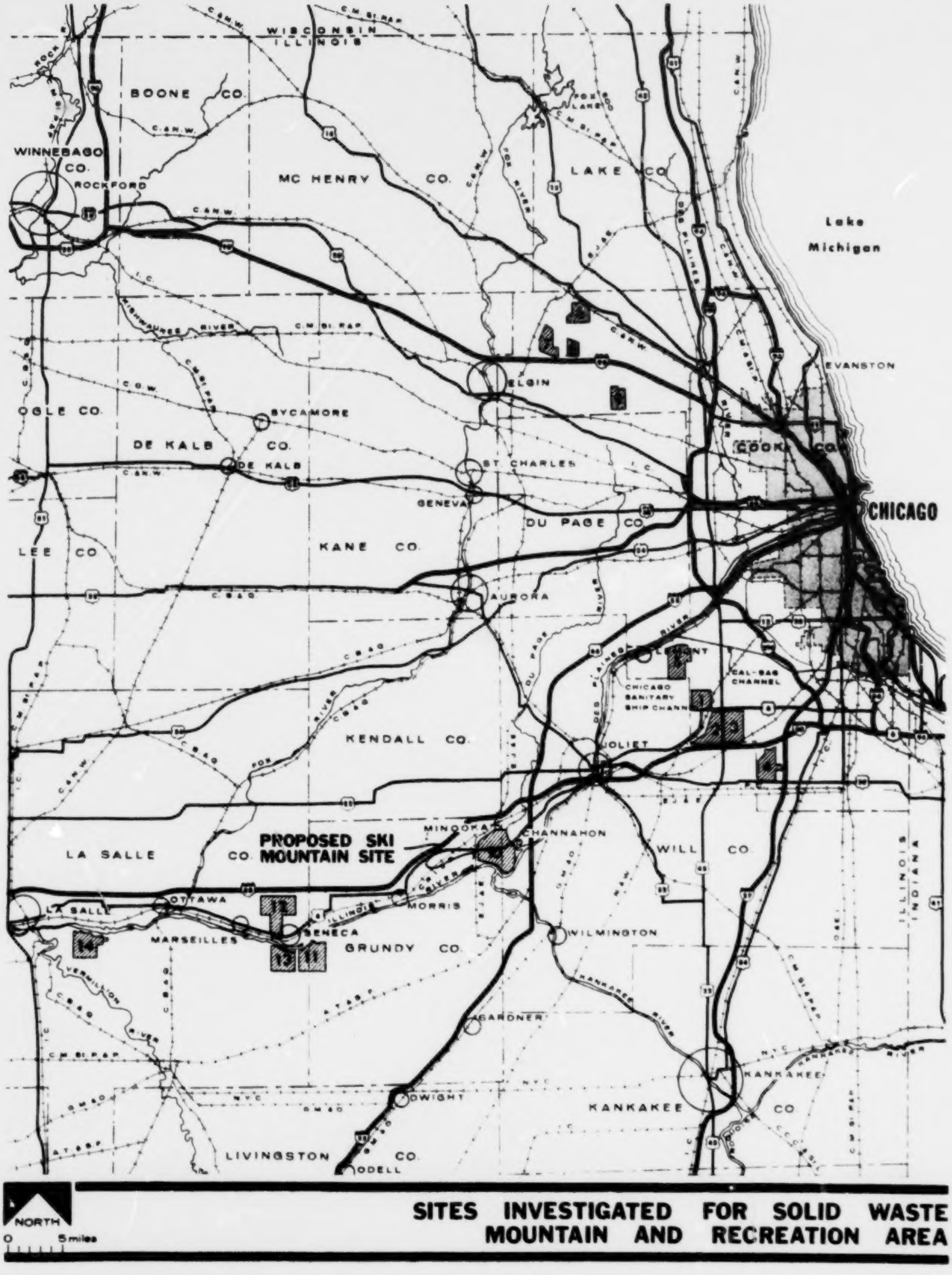
SITE RATING

From the preceding evaluation, the sites are rated in order of suitability for a solid waste mountain, as follows: 4, 5, 2, 1, and 3. However, none of the sites is considered really suitable for the solid waste disposal operation covered by this study. There is serious doubt that any of the sites could be acquired over the objections of the public and the numerous agencies that would be affected by use of the land for solid waste disposal.

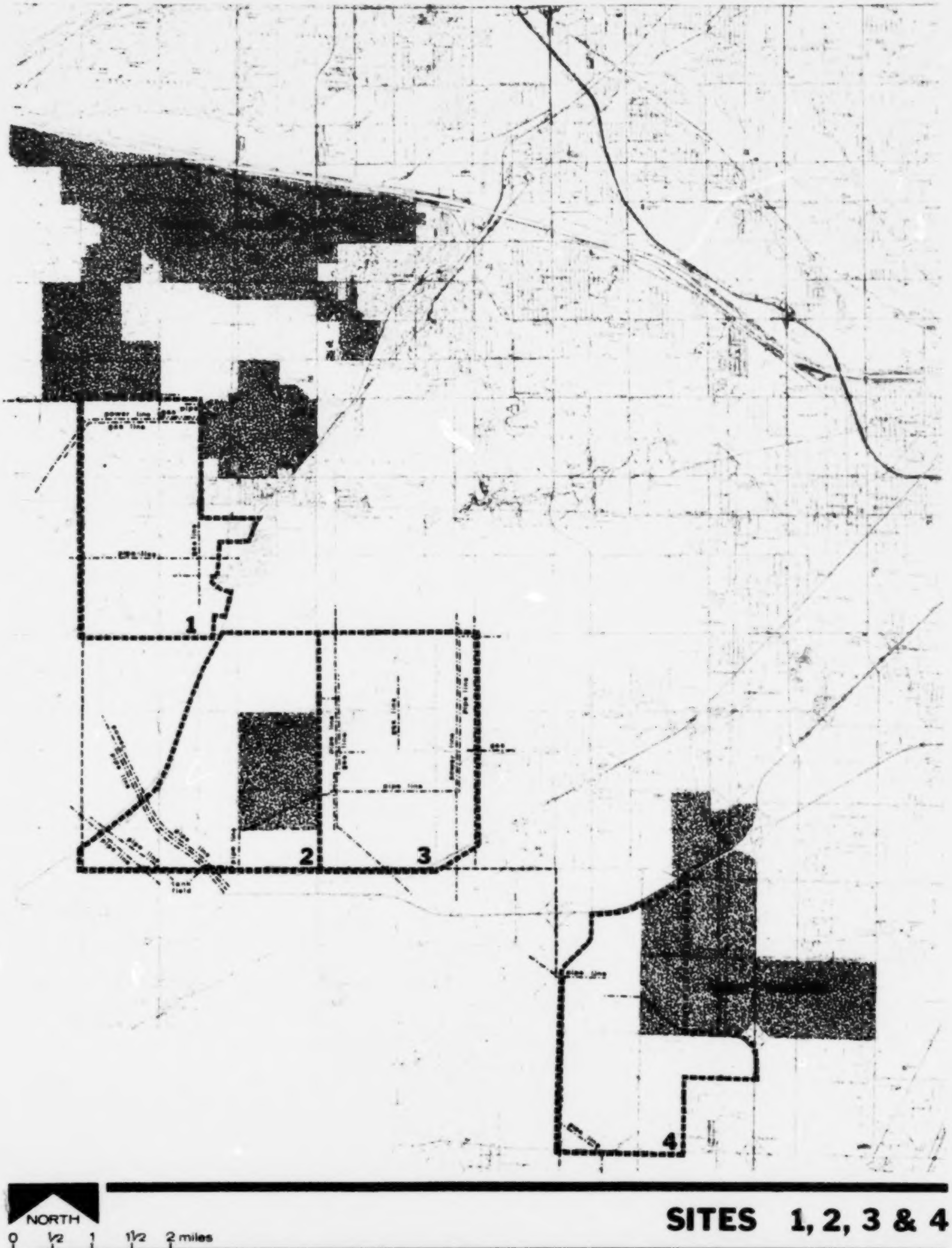
COMPARATIVE DATA ON INVESTIGATED SITES FOR SOLID WASTE MOUNTAIN AND RECREATION AREA

(All Numerical Values are Approximate)

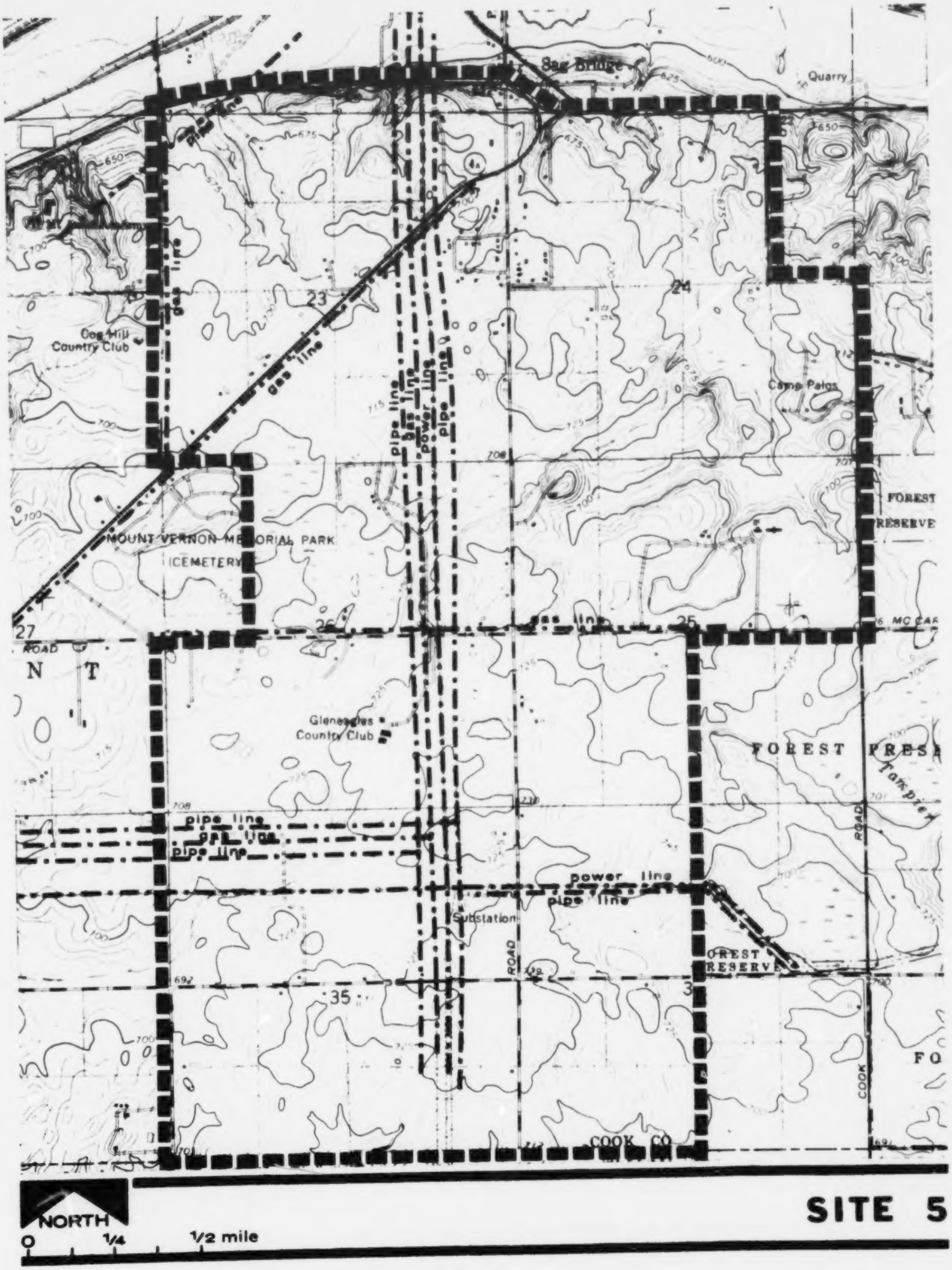
	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5
SIZE AND CONFIGURATION					
Area	3,200 acres	3,800 acres	3,900 acres	3,300 acres	3,500 acres
Dimensions	16,000' N-S, 8,000' E-W	16,000' N-S, 9,000'E-W	16,000' N-S, 10,000' E-W	16,000' N-S, 8,000' E-W	13,750' N-S, 13,200 E-W
EXISTING STRUCTURES IN SITE					
Single family residences	200	100	510	35	118
Other facilities (non-farm)	7	2	6	2	6
Utilities	2 power lines, 5 pipelines	1 power line, 5 pipelines	1 power line, 5 pipelines	2 pipelines	2 power lines, 8 pipelines
Thoroughfare	139th, 143rd, 151st, Wolf Rd	167th, 179th, 108th Ave	167th, 171st, 84th Ave, 94th Ave	Vollmer Rd, Flossmoor Rd Ridgeland Ave	McCarthy Rd, Bell Rd, State Hwy 171, Parker Rd, 131st St
LAND VALUE					
Average per acre (raw land)	$3,000 - $3,500	$3,500 - $4,500	$3,500 - $4,500	$3,500 - $4,500	$3,500 - $4,500
ACCESSIBILITY					
Distance from Loop	30 miles via I-94, I-57, US 6	31 miles via I-94, I-57, I-80, US 45	31 miles via I-94, I-57, I-80, US 45	28 miles via I-94, I-57 Vollmer	27 miles via I-55, US 45, 131st St
Rail access	Wabash track abuts site	Wabash track abuts site	CRI&P track abuts site	Track 0.5 mile from site	AT&SF 1 mile from site, across canal; GM&O track 0.25 mile from site
Highway access	Poor now; good in future	Good via I-80	Good via I-80	Good via I-80	Poor now; good in future
Water access	None	None	None	None	Calumet Sag Channel, Chicago Sanitary & Ship Canal
Proximity to Deep Tunnel	16 miles	17 miles	17 miles	14 miles	20 miles
RELATIONSHIP TO					
MSDGC	Within District	Within District	Within District	Within District; includes proposed sludge disposal site	Within District
Forest Preserve	Abuts on north	Includes 1.5 sq mi	Abuts	Includes 1.0 sq mi	Abuts on east
Urban development	Considerable residential development; abuts Village of Orland Park	Scattered residences; no adjacent urban development	Includes Westhaven and Fernway Park developments	Abuts development in Village of Matteson	Scattered residential development; many public uses in and around site
NIPC Finger Concept	Partially in buffer wedge	In development corridor	In development corridor	Entirely in buffer wedge	Partially in buffer wedge
Area recreation needs	Acute	Acute	Acute	Acute	Acute
WATER POLLUTION POTENTIAL					
Aquifers present	Sand-gravel, dolomite	Sand-gravel, dolomite	Sand-gravel, dolomite	Dolomite	Dolomite
Thickness of glacial till	100' to 125'	50' to 100'	50' to 100'	50' to 75'	75' to 125'
Additional investigation needed	Yes	Yes	Yes	Yes	Yes
DRAINAGE					
General evaluation	Fair	Good	Good	Fair	Good
Outside area tributary to site	2 sq mi	0.5 sq mi	0.5 sq mi	10 sq mi	None
FOUNDATIONS	Detailed study needed	Detailed study needed	Detailed study needed	Detailed study needed	Detailed study needed
OBSTRUCTION TO AIR TRAFFIC					
Probable obstruction	Yes	Yes	Yes	Yes	Yes
Distance from O'Hare, Midway	22 miles; 12 miles	25 miles; 13 miles	25 miles; 13 miles	29 miles; 15 miles	18 miles; 10 miles
Distance from nearest airport	6 miles	6 miles	6 miles	3 miles	4 miles
Further evaluation needed	Yes	Yes	Yes	Yes	Yes


WISCONSIN
ILLINOIS
BOONE CO.
WINNEBAGO CO.
ROCKFORD
MC HENRY CO.
LAKE CO.
Lake Michigan
EVANSTON
ELGIN
SYCAMORE
OGLE CO.
DE KALB CO.
DE KALB
ST CHARLES
GENEVA
COOK CO.
CHICAGO
DU PAGE CO.
LEE CO.
KANE CO.
AURORA
LEMONT
CAL-SAG CHANNEL
CHICAGO SANITARY SHIP CHANN
KENDALL CO.
JOLIET
MINOOKA
CHANNAHON
PROPOSED SKI MOUNTAIN SITE
LA SALLE CO.
WILL CO.
ILLINOIS
INDIANA
OTTAWA
LA SALLE
MORRIS
SENECA
MARSEILLES
GRUNDY CO.
WILMINGTON
GARDNER
KANKAKEE
KANKAKEE CO.
DWIGHT
LIVINGSTON CO.
ODELL
FOX RIVER
DES PLAINES RIVER
ILLINOIS RIVER
KANKAKEE RIVER
VERMILLION RIVER
KISHWAUKEE RIVER
ROCK R.
FOX LAKE
C.&N.W.
C.M.St.P.&P.
I.C.
C.B.&Q.
C.G.W.
E.J.&E.
N.Y.C.
A.T.&S.F.
G.M.&O.
C.&E.I.
NORTH
0
5 miles

SITES INVESTIGATED FOR SOLID WASTE MOUNTAIN AND RECREATION AREA


power line
gas line
gas line
1
2
3
4
tank field
NORTH
0
1/2
1
1 1/2
2 miles

SITES 1, 2, 3 & 4


Sag Bridge
Quarry
Cog Hill Country Club
23
24
gas line
pipe line
gas line
power line
pipe line
Camp Palos
FOREST
RESERVE
MOUNT VERNON MEMORIAL PARK
CEMETERY
27
ROAD
26
gas line
25
MC CAR
N T
Gleneagles Country Club
FOREST PRESE
Tampier
ROAD
pipe line
gas line
pipe line
power line
pipe line
Substation
ROAD
FOREST RESERVE
35
3
COOK
FO
COOK CO
NORTH
0
1/4
1/2 mile

SITE 5

APPENDIX D

CORRESPONDENCE REGARDING CONFLICT BETWEEN A 1000-FOOT HIGH SOLID WASTE MOUNTAIN IN COOK COUNTY AND AIR TRAFFIC

BLACK & VEATCH
CONSULTING ENGINEERS

AREA CODE 816
TEL. 361-7000

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS: P. O. BOX NO. 8405
KANSAS CITY, MISSOURI 64114

Metropolitan Sanitary District of Greater Chicago
Solid Waste Disposal Study (Ski Mountain)
Project 5180

October 31, 1969

Mr. Frank Dalton
The Metropolitan Sanitary District of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

Dear Mr. Dalton:

We believe that the effects of the proposed 1000-foot high solid waste mountain on air traffic in the Chicago area should be determined as soon as possible.

The normal method for determining whether a proposed tall structure will be a significant hazard to air traffic is to submit FAA Form 7460-1 to the Federal Aviation Administration of the U.S. Department of Transportation, with a request that an immediate study be made of the matter. Since the Metropolitan Sanitary District is the sponsoring agency for the proposed solid waste mountain, we believe it appropriate that the District submit this form and request to the Federal Aviation Administration.

Accordingly, we have filled in the appropriate information on a copy of FAA Form 7460-1 and are enclosing this form and two blank copies of it.

The data shown on the form are merely our suggestions and may be modified as you see fit.

Please complete one of the blank forms and submit it, together with a request for an immediate study, to:

Mr. M. L. Kolhler, Chief
Air Traffic Branch
FAA Chicago Area Office
3166 Des Plaines Avenue
Des Plaines, Illinois 60018

We would appreciate receiving copies of all correspondence between the

Metropolitan Sanitary District and the FAA on this matter, so that we will be apprised of the FAA findings.

Very truly yours,

BLACK & VEATCH

F. E. Kirkpatrick

FEK:mm

November 4, 1969

Mr. M. L. Kolhler, Chief
Air Traffic Branch
FAA Chicago Area Office
3166 Des Plaines Avenue
Des Plaines, Illinois 60018

Dear Mr. Kolhler:

Subject: Solid Waste Disposal Study (Ski Mountain)

The Metropolitan Sanitary District is preparing an engineering design report for a possible solution to the solid waste disposal problem of Cook County.

This report is being prepared because the District does anticipate a substantial amount of excavated materials from our proposed capital improvements program for the next ten years. It is estimated that we may have approximately six million cubic yards of rock excavated annually from rock tunnels, and we are actively pursuing a solution to the problem of disposing of this rock material so as not to create other environmental problems within Cook County.

In order to make certain that our excavation disposal solution is compatible with solutions of other agencies, we have established a steering committee composed of representatives indicated on the attached list.

One of the possible solutions to the solids disposal problem is to develop a mountain composed of solid materials. The ultimate development will have a tremendous recreational potential and will be developed in such a manner so as to be free of any environmental hazard.

We have received a grant of $140,000 from the Department of Health, Education and Welfare, Bureau of Solid Waste Management, Public Health Service, Grant number DO-1-UI-00163, in order to develop a design report for this work.

Work has progressed on this design report; however, we do want to determine what effect, if any, the proposed mountain will have on air traffic in the Chicago area if the proposed development is located in the area which is indicated on the attached map.

We have completed your Form 7460-1, and we would appreciate your review of this matter and any comments which you may have. Work on our design report commenced May 1969 and is scheduled to be completed by April 1970. Therefore, we would appreciate your comments at your very earliest convenience.

Very truly yours,

Forrest C. Neil
Acting Chief Engineer

FCN:FED:jn

Enclosures

FYI:
Bacon, Neil, Dalton, Kelly, Black & Veatch (w/att)

THIS COPY FOR

Form Approved, Budget Bureau No. 04-R0001.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

TO BE COMPLETED BY FAA

AERONAUTICAL STUDY NO.

FAA WILL COMPLETE AND RETURN THIS FORM IF ONE OR MORE OF THE FOLLOWING IS APPLICABLE, OTHERWISE SEPARATE ACKNOWLEDGEMENT WILL BE ISSUED.

A. A STUDY OF THIS PROPOSAL HAS DISCLOSED THAT THE PROPOSED STRUCTURE.

☐ DOES NOT REQUIRE A NOTICE TO FAA.

☐ WOULD NOT EXCEED ANY STANDARD OF PART 77 AND WOULD NOT BE A HAZARD TO AIR NAVIGATION.

☐ SHOULD BE MARKED AND LIGHTED PER FAA "OBSTRUCTION MARKING AND LIGHTING" ADVISORY CIRCULAR 70/7460-1.

☐ REQUIRES SUPPLEMENTAL NOTICE. NOTICE FORM (FAA FORM 117-1) ENCLOSED.

B. COPY SENT TO FCC? ☐ YES ☐ NO

REVIEWING OFFICER

DATE

1. NATURE OF STRUCTURE *(Complete both A and B below)*

A. *(Check one)* ☒ NEW CONSTRUCTION ☐ ALTERATION

B. *(Check one)* ☒ PERMANENT ☐ TEMPORARY *(State length of time)* ______ Mos.

2. NAME AND ADDRESS OF INDIVIDUAL, COMPANY, CORPORATION, ETC. PROPOSING THE CONSTRUCTION OR ALTERATION *(Number, Street, City, State and Zip Code)*

TO
The Metropolitan Sanitary District
of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

3. TYPE AND COMPLETE DESCRIPTION OF STRUCTURE Solid waste mountain and recreation area rising approximately 1000 feet above existing ground. Base of mountain would be 6000 to 8000 feet wide. The mountain would form a ridge or a series of peaks one to two miles in length.

4. LOCATION OF STRUCTURE

A. COORDINATES *(To nearest second)*

LATITUDE °	LATITUDE '	LATITUDE "	LONGITUDE °	LONGITUDE '	LONGITUDE "
41	40	-	87	56	-

B. NEAREST CITY OR TOWN, AND STATE

(1) DISTANCE FROM 4B: 3 MILES

(2) DIRECTION FROM 4B: East

C. NAME OF NEAREST AIRPORT, HELIPORT, OR SEAPLANE BASE: Hinsdale Airport

(1) DISTANCE FROM NEAREST POINT OF 4C: 4 miles

(2) DIRECTION FROM AIRPORT: South

D. *DESCRIPTION OF LOCATION OF SITE WITH RESPECT TO HIGHWAYS, STREETS, AIRPORTS, PROMINENT TERRAIN FEATURES, EXISTING STRUCTURES, ETC. (Attach a highway, street, or any other appropriate map or scaled drawing showing the relationship of construction site to nearest airport(s). If more space is required, continue on a separate sheet of paper and attach to this notice.)*

Center of 3000-acre site is about 2 miles southeast of junction of Chicago Sanitary and Ship Canal with Calumet Sag Channel. Site is bisected by McCarthy Road and by Bell Road. See attached highway map.

5. HEIGHT AND ELEVATION *(Complete A, B and C to the nearest foot)*

A. ELEVATION OF SITE ABOVE MEAN SEA LEVEL	700 to 740
B. HEIGHT OF STRUCTURE INCLUDING APPURTENANCES AND LIGHTING *(if any)* ABOVE GROUND, OR WATER IF SO SITUATED	1000±
C. OVERALL HEIGHT ABOVE MEAN SEA LEVEL *(A + B)*	1740±

6. WORK SCHEDULE DATES

A. WILL START: 1973 ±

B. WILL COMPLETE: 2000 ±

7. OBSTRUCTION MARKINGS – The completed structure will be:

	YES	NO
A. MARKED AS SPECIFIED IN THE FAA ADVISORY CIRCULAR 70/7460-1, OBSTRUCTION MARKING AND LIGHTING		
B. LIGHTED AS SPECIFIED IN THE FAA ADVISORY CIRCULAR 70/7460-1, OBSTRUCTION MARKING AND LIGHTING	X	

I HEREBY CERTIFY that all of the above statements made by me are true, complete, and correct to the best of my knowledge.

8. NAME AND TITLE OF PERSON FILING THIS NOTICE *(Type or Print)*
Forrest C. Neil
Acting Chief Engineer

9. SIGNATURE *(In ink)*

10. DATE OF SIGNATURE: 11-6-69

11. TELEPHONE NO. *(Precede with area code)*: 312-5[illegible]

Persons who knowingly and willfully fail to comply with the provisions of the Federal Aviation Regulations Part 77 are liable to a fine of $500 for the first offense, with increased Penalties thereafter as provided by Section 902(a) of the Federal Aviation Act of 1958 as amended.

FAA Form 7460-1 (11-68) SUPERSEDES FAA Form 117.

12/10/69 Original to Mr. Dalton. FCN/w

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

CHICAGO AREA OFFICE
3166 DES PLAINES AVENUE
DES PLAINES, ILLINOIS 60018

9 DEC 1969

Mr. Forrest C. Neil
Acting Chief Engineer
The Metropolitan Sanitary District
of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

Dear Mr. Neil:

We have completed an aeronautical study of the proposed solid waste mountain and recreation area to be constructed as described in the FAA Form 7460-1, Notice of Proposed Construction or Alteration, that you submitted to us on 10 November 1969. The study was conducted within our organization and was not circularized to aviation interests as agreed upon in your telephone conversation with Mr. Keith Potts of our office on 17 November 1969.

Our study disclosed that the proposed facility would have the following effect upon aeronautical operations and procedures in the Chicago Metropolitan Area:

1. It would shield the new Chicago South radar site that we are installing to enhance air traffic control in the Chicago area. This would eliminate any low angle coverage to the west of the proposed mountain from approximately 280° to 300°, resulting in a mandatory relocation of the new radar. This radar site is very critical and vital to aeronautical operations in the Chicago area. Radar site acquisition in this area is most difficult and the present site is the only one we have found suitable to meet requirements. This proposed solid waste mountain would, therefore, jeopardize our radar planning.

2. It will be close to the radar microwave link repeater path between the LaGrange, Indiana radar site and the Chicago Air Route Traffic Control Center at Aurora, Illinois. There is a very good chance that the mountain will have an adverse effect on the performance of the LaGrange radar remoted to the Chicago ARTCC.

3. It will require that the initial departure altitude for aircraft departing the Midway Airport be increased from 2000 feet MSL to 3000 feet MSL. As a result of this increase, the minimum altitudes for the O'Hare parallel Runway 32 instrument approach procedure would be increased to 4000 feet MSL for Runway 32L and 5000 feet MSL for Runway 32R. This would place the aircraft above the glide path intercept point and would negate the procedure. Inasmuch as 2000 feet MSL is the only altitude available for aircraft departing Midway when Runway 32 approaches are in progress at O'Hare and the fact that it is imperative that parallel 32 approaches at O'Hare be retained, independent operations at Midway and O'Hare would be eliminated. This results in a substantial adverse effect on both O'Hare and Midway Airports.

4. It would require that Federal Airway V69 V173 V262 minimum obstruction clearance altitude be increased from 2000 feet MSL to 2800 feet MSL and the minimum en route altitude be increased from 2500 feet MSL to 2800 feet MSL. Present procedures provide for the use of 2000 feet MSL in this area and this would be increased to 3000 feet MSL, thus the loss of a cardinal altitude.

5. We are presently in the process of establishing a full instrument landing system (ILS) for Runway 4 at Midway. The localizer outer marker site (LOM) is planned to be located 4.4 to 4.5 miles southwest of Midway and cannot be relocated because of existing structures. The proposed mountain would be located in the procedure turn area of this new procedure and would be of such height as to require an unacceptable descent gradient after the outer marker site and would negate the whole system.

6. Inasmuch as the proposed facility would exceed 500 feet above ground, it would be in conflict with Public Law 85-726, FAA Act of 1958. The Act defines "navigable airspace" as that "airspace above minimum altitudes of flight prescribed by regulations issued under this Act, and shall include airspace needed to ensure safety in take-off and landing of aircraft." Minimum flight altitudes are prescribed by regulation in Section 91.79 of the Federal Aviation Regulations. Generally speaking from a Visual Flight Rules standpoint, it must be considered that the navigable airspace include all airspace 500 feet and more above the surface and that airspace below 500 feet required for flight over sparsely populated areas. In view of the fact that the proposed facility would be located in an area that is used extensively for Visual Flight Rules traffic transitioning to and from the airports in the Chicago Metropolitan Area to outlying points, and would occupy the airspace

which has been declared to be "navigable airspace", any aircraft attempting to use this airspace would run a risk of colliding with the proposed facility. Therefore, the structure would have an adverse effect upon Visual Flight Rules operations in the Chicago area.

In consideration of the foregoing, we have determined that the proposed solid waste mountain could have a substantial adverse effect upon aeronautical operations and procedures in the Chicago Metropolitan Area.

We regard the navigable airspace as a limited national resource and have been charged by Congress with administering it for the public benefit. While the aviation community is the principal user, there are others who have legitimate requirements for the use of airspace. When conflicts of interest over the use of airspace arise out of proposals such as yours, we emphasize the need for conserving the navigable airspace, for protecting air navigation facilities and aeronautical procedures, the encroachments of which would preclude them from performing their operational functions for the use of aircraft. However, every effort must be made to satisfy both interests.

Therefore, we request that at such time as plans for the proposed mountain become more definite, that you notify us and at that time, we will initiate a full aeronautical study, which will include circularization of the proposal to all interested persons and issue an official airspace determination.

Additionally, we would like to suggest that you coordinate the subject proposal with the City of Chicago, Department of Aviation, concerning their plans for siting of future airports in the Chicago Metropolitan Area.

If we may be of any further assistance or service in this matter or if you have any questions, please do not hesitate to contact us.

Sincerely,

M. L. Koehler

M. L. KOEHLER
Chief, Air Traffic Branch, CHI-500

RICHARD J. DALEY
MAYOR

CITY OF CHICAGO
OFFICE OF THE MAYOR

January 12, 1970

Mr. F. E. Kirkpatrick
Black & Veatch
1500 Meadow Lake Parkway
P. O. Box 8405
Kansas City, Missouri 64114

Dear Mr. Kirkpatrick:

Your letters of October 8 and October 28 furnished information concerning studies directed toward the construction of a 1000-foot high solid waste mountain in southwest Cook County, and inquired concerning the compatibility of this proposal with the long range aviation program of the City of Chicago.

The information forwarded with your correspondence has been circulated to the departments of the City concerned with aviation planning, requesting their advice on the impact of the proposal you suggested. The replies indicate that the development of a 1000-foot high mountain in any of the general areas under consideration would conflict with the development of sites now under consideration for a future major airport. Construction on the proposed project prior to the selection of a site for a major airport could result in the elimination of a site for possible airport development.

A meeting with you to discuss the matter is not considered to be necessary. However, if you desire to discuss the matter further, a meeting would be scheduled at your convenience.

With kindest regards,

Sincerely,

John B. W. Corey
Administrative Assistant

cc: F. Dalton, MSDGC

BLACK & VEATCH
CONSULTING ENGINEERS

AREA CODE 816
TEL. 361-7000

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS: P. O. BOX NO. 8405
KANSAS CITY, MISSOURI 64114

February 19, 1970

Metropolitan Sanitary District
of Greater Chicago
Solid Waste Disposal Study
Project No. 5180

Mr. Forrest Neil
Metropolitan Sanitary District
of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

Dear Mr. Neil:

At your request, we submit our version of the outcome of discussions held with the FAA concerning the expected effect of the solid waste mountain on air traffic in the Chicago area. Please review these comments carefully in the light of your notes and recollections, as well as those of Mr. Scapin, so that the meeting summary will present a true picture of the situation to the sub-committee.

The meeting was held at 1:30 p.m., February 18, 1970 in the FAA Chicago Area Office at Des Plaines. Those in attendance were:

John Scapin	Subcommittee, Village Engineer, Wilmette
Forrest Neil	MSDGC
Bill Mercks	FAA
Keith Potts	FAA
Harry McIntyre	FAA
Carl W. Johnson	FAA
C. W. Collins	FAA
Mike Moore	FAA
L. W. Bremser	Black & Veatch
F. E. Kirkpatrick	Black & Veatch

Our understanding of the position taken by the FAA officials with regard to the several items discussed in their letter to you, dated December 9, 1969, is summarized below:

(1) It was pointed out that site selection for radar was a difficult problem and that the site in question had been selected after much careful study. The purpose of this installation is to improve radar coverage of traffic from the

small airports in the Chicago area, as well as from the major commercial airports. The radar will be mounted close to the ground and beamed upward at a slight angle to eliminate, as much as possible, interference from structures on the ground. Because of ground interference, it was not considered practical to mount the radar atop the mountain.

The radar display will be installed remotely at the control center. The question was raised concerning the installation of another radar to cover the sector blanked out by the mountain. This is possible but not desirable since it would require another radar display. The technology is not yet available to combine displays from two radars. Development effort is being expended on this problem and it is conceivable that a multi-radar display will be developed. If and when this is available, an additional radar might be sited to cover the blind area.

(2) The micro-wave path between LaGrange, Indiana, and Aurora, Illinois, may require modification, possibly an additional repeater station to carry the path around the mountain. This would cost $50,000 ±, plus land for the site.

(3) The fact that the increased altitude required at Midway to clear the mountain would also raise the approach altitude to Runways 32R and 32L at O'Hare means that simultaneous landings on 32L and 32R would experience interference, thus cutting capacity of these approaches. It was estimated that approaches in the 32 direction are necessary about 30% of the time. During such periods of interference, stack-ups would occur and traffic would be affected not only at Chicago but all across the country.

(4) The loss of a cardinal altitude means that a proportionately smaller amount of traffic could be accommodated.

(5) The mountain would defeat the purpose of the 1LS for Runway 4 at Midway.

(6) By being over 500 feet above the ground, the mountain would extend into airspace used by a large volume of small, private aircraft in skirting the heavy Chicago area traffic and, in effect, would reduce the air space. It is particularly important for pilots not familiar with the area. This is not an insurmountable problem but would probably require that the mountain be well-lighted to outline the obstruction at night.

Conclusion: It was indicated that unless Midway was abandoned, FAA would not accept the mountain at the location proposed. It was indicated that there were probably no other sites in this general area of Cook County which would not have basically the same objections. It was believed that Item 1 was a problem that might be solved by a monetary expenditure along with advanced technology; Item 2 could be solved by the expenditure of funds; Items 3, 4 and 5 were insurmountable unless Midway Airport was abandoned; and Item 6 could be compromised.

The subject of a future Chicago airport was discussed in general, and the FAA representatives expressed the opinion that if the facility was sited somewhere to the south of the mountain site as presently envisioned, the mountain would very likely cause a hazard to its operations.

Very truly yours,

BLACK & VEATCH

F. E. Kirkpatrick

FEK:mm

BLACK & VEATCH
CONSULTING ENGINEERS

AREA CODE 816
TEL. 361-7000

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS: P. O. BOX NO. 8405
KANSAS CITY, MISSOURI 64114

Metropolitan Sanitary District
of Greater Chicago
Solid Waste Disposal Study
Project 5180

March 17 , 1970

Mr. Frank Dalton
Metropolitan Sanitary District
of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

Dear Mr. Dalton:

At your request, we submit herein our understanding of the Ski Mountain Steering Committee Meeting on March 13.

Chairman Sosewitz opened the meeting at 2:00 p.m. The following were present:

Name	Position	Organization
Ben Sosewitz	Acting General Superintendent	MSDGC
Forrest C. Neil	Acting Chief Engineer	MSDGC
Frank E. Dalton	Assistant Chief Engineer	MSDGC
Peter Johnson	Project Officer	USPHS Bureau of Solid Waste Management
John Harmon	Research Planner	NIPC
Peter H. Sonnenfeld	Planning Officer	Illinois State Department Local Governmental Affairs
James Castle	Engineer	Bureau of Sanitation City of Chicago
Douglas W. Smith	Supt. Streets & Refuse	Evanston, Illinois
Norman L. Bacon	Engineer & Planning Director	Village of Oak Lawn
Richard Buck	Landscape Architect	Forest Preserve District
B. Kieth Potts	Federal Aviation Administration	Air Traffic - Airspace
Gary Englehorn	Engineer- Liaison w/ Federal Aid	MSDGC
Mel Noel	Chief Engineer	Bureau of Sanitation City of Chicago
F. E. Kirkpatrick	Project Engineer	Black & Veatch
L. W. Bremser	Partner	Black & Veatch

A copy of the Black & Veatch letter of February 19, 1970, reporting results of the meeting held with the Federal Aviation Administration (FAA) on February 18, was passed out. Mr. B. K. Potts, an FAA representative, indicated that the consultants' interpretation was substantially correct. He stated that a solid waste mountain at the Lemont Township site with top elevation up to elevation 1049 MSL (300' ± above ground) would pose no problems for air traffic, but that a 500' mountain (top elevation 1249' MSL) would have to be studied and would pose some problems to FAA; although, the problems would be much less severe than for a 1000' mountain. It was indicated that much the same problems would be posed by a 1000' mountain located at any of the sites considered in southwest Cook County. Mr. Potts also pointed out that the mountain would have effects on the proposed new Chicago airport which is expected to be located somewhere south of Cook County, but that these effects could not be determined until an airport site has been selected.

Further discussion indicated that a solid waste mountain, possibly as high as elevation 1500' MSL; might be tolerated by the FAA at certain locations in northwestern Cook County.

It was concluded that there are two alternatives available: construct a mountain substantially less than 1000' high in Cook County; or build the 1000' mountain outside Cook County. The merits of basing the study on sites in Cook County and outside Cook County were discussed. It was the consensus that, if a definitive study of a solid waste mountain outside Cook County was to be undertaken, the State of Illinois should become involved in sponsoring the work.

The consultants noted that while there may be suitable sites for a 1000' solid waste mountain along the Illinois Waterway outside Cook County, the feasibility of skiing facilities would be reduced by a shorter season and the necessity for snow-making more of the time if the site were located south of Cook County. Investigations show that ski slopes in Cook County have a substantially shorter season than those only 60 to 70 miles further north in southern Wisconsin.

The Consultants stated that about $95,000 had been committed to date on the study, leaving some $70,000 available for the Consultant's completion of the study.

It was noted that if the direction of the study is altered to cover one or more smaller mountains, this change should be cleared with the Board of the Metropolitan Sanitary District of Greater Chicago and with the Bureau of Solid Wastes.

The consultants were instructed to provide the Committee with preliminary findings by April 17 on:

1. The feasibility of a mountain 500' or less in height at site 5.
2. Whether there is a site in northwest Cook County that could accommodate a 500' ± mountain.
3. Approximate distance it will be necessary to go to find a site for a 1000' high mountain which will not interfere with air traffic.

It was noted that private haulers represented by the Chicago and Suburban Refuse Disposal Association collect more than half of the solid wastes in Cook County and have a vital interest in the future disposal program, and it was suggested that it would be appropriate to have a representative of the Association on the Steering Committee.

To be certain that the entire Steering Committee is fully informed, it is suggested that copies of the FAA letter of December 9, 1969 as well as the Black & Veatch letter of February 19 be sent to all members of the Steering Committee.

A tentative date for April 24 was selected for the next committee meeting.

Very truly yours,

BLACK & VEATCH

F. E. Kirkpatrick

FEK:mm

APPENDIX E

DATA ON INVESTIGATED SITES FOR A SOLID WASTE MOUNTAIN AND RECREATION AREA IN NORTHWEST COOK COUNTY WITHOUT SERIOUS CONFLICT WITH AIR TRAFFIC

Data are presented for four investigated sited in northwest Cook County, plus Revised Site 5 in Lemont Township modified for a 300-foot mountain which would not conflict with air traffic. Considerations common to two or more sites are discussed under topic headings relating to site suitability. Detailed information peculiar to individual sites is presented in a tabulation following the general discussion. A general location map and maps of the individual sites follow the tabulation.

Also attached is a brief discussion of the areas nearest Chicago where the Federal Aviation Administration indicates that a 1,000-foot high solid waste mountain would not conflict significantly with air traffic.

SIZE AND CONFIGURATION

Area, width and length limit the permissible height and volume of a solid waste mountain, influence its general form, and restrict design flexibility. A large site with a generous width permits a higher landfill as well as greater latitude in naturalizing the mountain into the surrounding landscape. To obtain maximum height and fill capacity on a small site, naturalization must be sacrificed. Sites 6, 7 and 9 would permit much greater design flexibility on a 500-foot high mountain with an average side slope of 4 to 1 than Site 8 which has a width of only one mile and an area of only 1,200 acres. Revised Site 5 was limited to a height of 300 feet (MSL elevation 1049) to eliminate conflict with air traffic, and its area was reduced to about 1,400 acres.

Site size and configuration were governed by availability of large, relatively undeveloped tracts not bisected by major thoroughfares which satisfy to a reasonable degree the other site selection parameters discussed.

The volume for solid waste deposition in a mountain that could be constructed on a site is a major factor in evaluation of potential sites. The attached site maps show a preliminary filling plan for each site. Landfill capacity in acre-feet for each site was calculated and is shown on the attached graph together with the estimated cumulative landfill capacity in acre-feet required for disposal of Cook County refuse prior to 1995, based on the following assumptions:

- The disposal operation would be conducted at one site and would start in 1975.
- Between 1975 and 1985, only 50 per cent of the wastes not disposed of through existing incinerator plants, or plants currently under construction, would go to the Ski Mountain disposal site.
- After 1985, all solid wastes not incinerated would go to the Ski Mountain disposal site.
- Rock spoil from the storage chambers for the proposed deep tunnel system would be delivered to the Ski Mountain disposal site at a uniform annual rate over a 10 year period starting in 1975, and would occupy a total of 75,000 acre-feet of space in the solid waste mountain, including a 35 per cent swell factor.

Intersections of each site capacity line on the graph with the curves of cumulative required landfill space indicate the year that the site would be filled under the assumed conditions. Completion dates are shown to range from 1990 to beyond 2000.

Landfill capacities of the sites considered herein range from 170,000 to 280,000 acre-feet. This compares with a capacity of approximately 1,000,000 acre-feet estimated for a 1,000-foot solid waste mountain on the original Site 5.

EXISTING STRUCTURES ON SITE

Sites with fewer existing structures are preferable to those having extensive development because acquisition would be less costly and development would disrupt fewer people.

The sites under consideration in northwest Cook County are generally less populated than those considered in southwest Cook County. Only Site 9 shows any indication of recent subdivision for development. Some areas adjacent to the other sites, however, are rapidly urbanizing. Observations indicate that basically all of the structures are of good quality, whereas a considerable number of the structures located on sites in southwest Cook County were substandard.

None of the sites have commercial or industrial development except Site 9 which has an existing gravel pit operation and one radio tower. Site 9 is the only site traversed by a major utility, a large gas pipeline.

Minor roads traverse all sites. Ultimate design for the completed landfill will determine which roads would have to be entirely eliminated and which would be rerouted to serve local traffic. Only Site 6 is traversed by a major thoroughfare (Dundee Road).

LAND VALUE

Generally, land values in northwest Cook County are much higher than in southwest Cook County. The fact that most of the dwelling units in the area are large estates suggests that current land value estimates of $10,000 to $15,000 per acre may be low. Because of impending development, land acquisition will become more costly in the future.

ACCESSIBILITY

Sites 7 and 8 have direct access to the Northwest Tollway. Access to Site 6 is also provided by the Northwest Tollway, but three miles of travel on Barrington Road is required to reach the site from the Tollway. Site 9 is two miles south of the Northwest Tollway via Rohlwing Road.

Sites 6 and 7 have rail access. However, the railroad that could serve Site 7 does not traverse the heavily populated areas of Cook County. None of the sites have access to water transportation routes. All of the sites are over 40 road miles from the initial stage of the proposed deep tunnel project.

Passenger transportation by rail would be beneficial in making the recreation facilities available to the maximum number of people. Only Site 6 would have direct access to commuter rail under the C.A.T.S. recommended transit system.

RELATIONSHIP TO OTHER LAND USE

With the exception of Site 7, all of the investigated sites are located within or partially within the Metropolitan Sanitary District of Greater Chicago. All sites abut existing Forest Preserve holdings but only Site 5 includes Forest Preserve lands. All sites are in the path of urbanization except, perhaps, Site 6 which does not presently show signs of impending development. Sites 7 and 8 would be most compatible with the proposed NIPC Finger Concept of urban development as both are located in a proposed low density buffer wedge between development corridors. Site 9 is in a proposed development corridor and would not be compatible with the Finger Concept. Site 6 is in a fringe area compatible with low density or open space development.

Sites 7 and 8 contain parts of South Barrington, Site 6 includes about 80 acres of the incorporated area of Inverness and Site 9 includes an area within the city limits of Schaumburg.

WATER POLLUTION POTENTIAL

Water pollution potential of the sites was evaluated from information contained in publications of the Illinois State Geological Survey and discussions with State Geological Survey personnel at the Naperville, Illinois office. Available data indicate that geological conditions at all of the sites are generally favorable for solid waste disposal. The creviced dolomite aquifer which underlies the sites is covered with relatively impervious glacial till, ranging in thickness from about 100 to 200 feet. Although some of the till would probably be excavated and used for covering the refuse, a sufficient thickness of till would remain to prevent the passage of leachate in sufficient quantity to cause significant pollution of usable ground water. Leachate would probably be collected, by underdrains, and treated as additional protection of both surface water and ground water.

Consideration was not given to investigated sites on the western edge of northwest Cook County because geological reports indicate that in this area sand and gravel deposits overlay the creviced dolomite. Under this condition, it would be difficult to prevent pollution of the aquifer.

DRAINAGE

Where possible, sites were selected in the upper portions of watersheds to minimize the amount of runoff that would need to be diverted. Ownership of all drainage area tributary to a site would be advantageous, as this would permit filling in a manner to facilitate drainage.

Revised Site 5, and Sites 6, 7 and 8 are considered suitable from the standpoint of drainage. Runoff from a large outside area which flows through Site 9 would reduce the usable area of this site or necessitate extensive grading for proper control of drainage.

FOUNDATIONS

Soil borings and other subsurface investigations will be required to determine whether the subsurface formations will support a solid waste mountain, and to determine the structural design parameters of the fill. Foundation conditions may control the maximum slope of solid waste fill and thereby limit the height of fill. Subsurface investigation will also provide further data for evaluation of water pollution potential.

Since each site is underlain by a substantial depth of glacial till bearing on bedrock, foundation conditions are expected to be similar for all sites except for variations in depth of till. Therefore, it will probably be necessary to make subsurface investigations of only the site or sites selected on the basis of other factors.

OBSTRUCTION TO AIR TRAFFIC

The Federal Aviation Administration (FAA), Chicago office, provided guideline elevations for structure heights at the four sites which would not adversely affect air traffic at O'Hare Airport. The FAA advised that structures within the guideline heights on the four sites would not interfere with traffic control radar.

Although appreciably higher structures could be accommodated by air traffic in northwest Cook County than in southwest Cook County, the height of a solid waste mountain in the northwest area would be restricted to less than 1,000 feet. Structures over 500 feet high would constitute obstruction to small aircraft on VFR navigation.

MAPS AND SITE DETAILS

Attached are a detailed tabulation of evaluation data for each of the five sites, a tabulation of advantages and disadvantages for each site, a location map, and maps of each of the sites showing a preliminary filling plan.

REVISED SITE 5

Advantages

1. Shorter haul distance than NW sites.
2. Rail access.
3. Water access.

4. Freeway access good in future when South Suburban Freeway is completed.
5. Relatively close to initial stage of the proposed deep tunnel project.
6. Partially screened by Forest Preserve District, Cal Sag Channel and proposed freeway.
7. Partially in NIPC Open Space Wedge.
8. Minimum water pollution potential.

Disadvantages

1. Site configuration limits design flexibility.
2. Lowest fill capacity of all sites.
3. Site contains two large public facilities (Camp Palos and Catholic Home for the Aged).
4. Site traversed by two pipelines, two gas lines and a power line.
5. Site requires rerouting of Calumet Sag Road and a portion of State Highway 83.
6. Existing freeway access is poor.
7. Proposed South Suburban Freeway may encroach on site.
8. Contains 80 acres of Forest Preserve land.
9. FAA restrictions prevent construction of solid waste mountain in excess of elevation 1,049,or about 300 feet above the ground surface.

SITE 6

Advantages

1. Favorable site configuration permits reasonable design flexibility.
2. Largest fill capacity.
3. Sparsely developed.
4. Large ownerships.
5. No major utility conflict.
6. Direct rail access via Chicago and Northwestern.
7. Direct access to commuter rail under C.A.T.S. recommended transit system.
8. Favorable relationship to Forest Preserve District holdings.
9. Minimum water pollution potential.

Disadvantages

1. Major thoroughfare must be rerouted.
2. High land and acquisition cost.
3. Poor highway access.
4. No water access.
5. Remote from initial stage of the proposed deep tunnel project.
6. Abuts urbanized area on two sides.

SITE 7

Advantages

1. Favorable site configuration permits reasonable design flexibility.
2. Large fill capacity.
3. Sparsely developed.
4. Large ownerships.
5. No major utility or thoroughfare conflict.
6. Good freeway access.
7. Favorable relationship to Forest Preserve District holdings.
8. In NIPC Open Space Wedge.
9. Minimum water pollution potential.

Disadvantages

1. High value residential subdivision abuts site.
2. High land acquisition cost.
3. Rail access via Elgin, Joliet and Eastern provides no direct connection to Cook County.
4. No water access.
5. Remote from initial stage of the proposed deep tunnel project.
6. Not in MSDGC.

SITE 8

Advantages

1. Sparsely developed.
2. Large ownerships.
3. No major utility or thoroughfare conflict.
4. Good freeway access.
5. Favorable relationship to Forest Preserve District holdings.

6. In NIPC Open Space Wedge.
7. Minimum water pollution potential.

Disadvantages

1. Design flexibility severely limited by site size and configuration.
2. Low volume fill capacity.
3. High value residential subdivision abuts site.
4. High land acquisition cost.
5. No rail access.
6. No water access.
7. Remote from intial stage of the proposed deep tunnel project.

SITE 9

Advantages

1. Site configuration permits adequate design flexibility.
2. Shorter haul distance via freeway than other NW sites.
3. Favorable relationship to Forest Preserve District holdings.
4. Minimum water pollution potential.

Disadvantages

1. Rapidly urbanizing – new residential subdivision presently exists on site.
2. Gas line traverses site.
3. Highest land acquisition cost of all sites.
4. No rail access.
5. No water access.
6. Remote from initial stage of the proposed deep tunnel project.
7. WGN radio tower on site.
8. In NIPC Development Corridor.
9. Extensive grading required – poor drainage conditions.

COMPARATIVE DATA ON INVESTIGATED SITES FOR SOLID WASTE MOUNTAIN AND RECREATION AREA

(All Numerical Values are Approximate)

	REVISED SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
SIZE AND CONFIGURATION					
Area	1,400 acres	1,900 acres	2,300 acres	1,200 acres	1,850 acres
Dimensions	9,000 N-S, 6,000-10,000 E-W	12,000 N-S, 8,500 E-W	15,000 N-S, 6,500 E-W	10,000 N-S, 5,300 E-W	10,000 N-S, 8,000 E-W
Practical height of mountain	350'	550'	500'	500'	500'
Volume of mountain	190,000 acre-feet	280,000 acre-feet	270,000 acre-feet	170,000 acre-feet	240,000 acre-feet
EXISTING STRUCTURES IN SITE					
Single family residential	90	50	30	20	200
Other facilities (non-farm)	Church, school, YMCA camp, home for aged	None	None	None	Gravel pit, radio towers
Utilities	2 pipelines, 2 gas lines,	No major	No major	No major	1 gas pipeline
Thoroughfares	Cal-Sag Rd, State Hwy 83, Bell Rd	Bradwell, Dundee	Bartlett, Penny, Mundhank	Mundhank	Meachom
LAND VALUE					
Average cost per acre	$7,000 - $8,000	$10,000	$10,000	$10,000	$10,000 - $15,000
ACCESSIBILITY					
Distance from Loop	27 miles via I-55, US 45, 131st St	33.5 miles via Kennedy Expwy, NW Tollway, Barrington Rd	31 miles via Kennedy Expway, NW Tollway	30.5 miles via Kennedy Expwy, NW Tollway	27 miles via Kennedy Expwy, NW Tollway, Rohlwing Rd
Rail access	AT&SF 1 mile from site, across canal; GM&O track 0.25 mile from site	Chicago & Northwestern	EJ&E	None	None
Highway access	Poor now; good in future	Poor (3 miles north of NW Tollway)	Good (NW Tollway Proposed N-S Freeway)	Good NW Tollway	Fair (2 miles south of NW Tollway, proposed N-S Rt. 53)
Water access	Calumet Sag Channel, Chicago Sanitary & Ship Canal	None	None	None	None
Proximity to Deep Tunnel	20 miles	47 miles via Dan Ryan, Kennedy, NW Tollway, Barrington Rd	44.5 miles via Dan Ryan, Kennedy, NW Tollway	44 miles via Dan Ryan, Kennedy, NW Tollway,	40.5 miles via Dan Ryan Kennedy, NW Tollway, Rohlwing Rd
RELATIONSHIP TO					
MSDGC	Within District	Partially within District	Outside District	Within District	Within District
Forest Preserve	Abuts on east	Abuts west boundary	Nearby on north, south & west	Abuts east boundary	Abuts east boundary
Urban development	Scattered residential development & public uses	Scattered farms	Scattered farms, area rapidly urbanizing	Scattered farms, area rapidly urbanizing	Scattered farms, ubanizing
NIPC Finger Concept	Partially in buffer wedge	In fringe area	In low density, open space wedge	In low density, open space wedge	In development corridor
Area recreation needs	Acute	Acute	Acute	Acute	Acute
WATER POLLUTION POTENTIAL					
Aquifers present	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite
Thickness of glacial till	75' to 125'	200'	200'	200'	100'
Additional investigation needed	Yes	Yes	Yes	Yes	Yes
DRAINAGE					
General evaluation	Good	Good	Good	Good	Poor
Outside area tributary to site	None	None	None	0.5 sq mi	10 sq mi
FOUNDATIONS	Detailed study needed	Detailed study needed	Detailed study needed	Detailed study needed	Detailed study needed
OBSTRUCTION TO AIR TRAFFIC					
Probable obstruction	500' mountain	1,000' mountain	1,000' mountain	1,000' mountain	1,000' mountain
Distance from O'Hare, Midway	18 miles; 10 miles	12 miles; 29 miles	13 miles; 30 miles	11 miles; 28 miles	5 miles; 22 miles
Distance from nearest airport	4 miles	7.5 miles Elgin Airport	5 miles Elgin Airport	6 miles Roselle Airport	2 miles Roselle Airport
Permissible elevation and height	1,049' MSL, 300-350'	1,749' MSL, 850-900'	1,649' MSL, 750-800'	1,649' MSL, 800-850'	1,460' MSL, 730-760'
Further evaluation needed	Notice to FAA required	Notice to FAA required	Notice to FAA required	Notice to FAA required	Notice to FAA required

NEAREST AREAS OUTSIDE COOK COUNTY WHERE A 1000-FOOT HIGH SOLID WASTE MOUNTAIN WOULD NOT CONFLICT SIGNIFICANTLY WITH AIR TRAFFIC

Conferences were held with the Chicago Area Office of the Federal Aviation Administration to determine the nearest areas outside Cook County where a 1,000-foot high solid waste mountain would not conflict significantly with air traffic. The FAA advised:

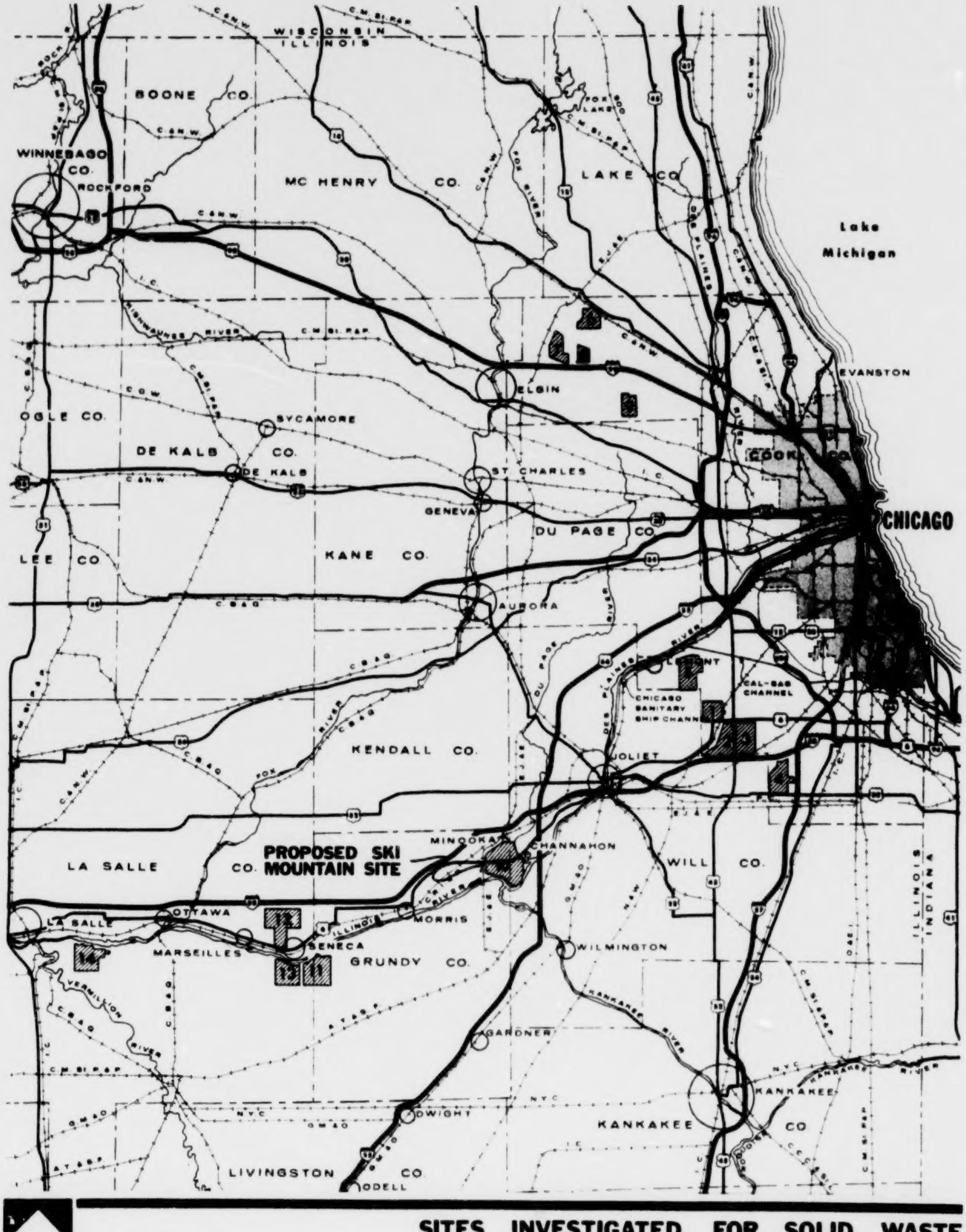
1. To the north and south of O'Hare Airport, heavy air traffic and existing airports virtually prohibit a 1,000-foot high solid waste mountain.
2. The proposed new Chicago Airport, expected to be located southwest of Chicago, may also be a major deterrent to a solid waste mountain south of Cook County.
3. Preliminary investigation indicates three general areas to the west where a 1,000-foot mountain would apparently cause few problems for air traffic. These areas, shown on the attached Chicago Region map, are located:

   Northwest in McHenry County in the Woodstock, Marengo, Harvard triangle;

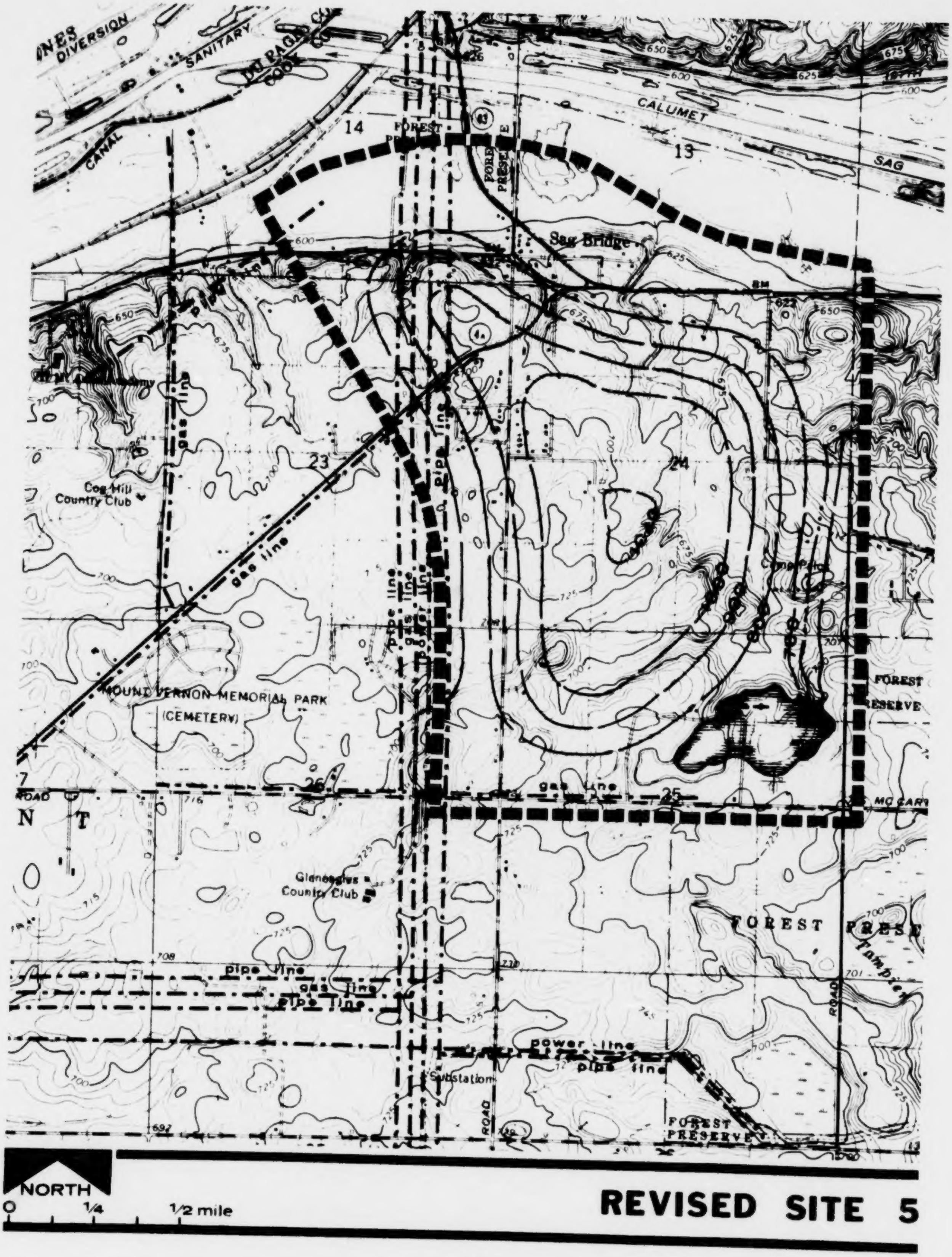
   West in Kane County, approximately 15 miles west of Elgin; and

   Southwest in Grundy or LaSalle Counties, south of the Illinois River and the Town of Seneca.
4. The FAA would have to make an in-depth study to render an official opinion of the effects on air traffic of a 1,000-foot high solid waste mountain in any of these areas.
5. Any structure more than 100 feet above the ground surface poses some obstruction to Visual Flight Rules navigation. However, since VFR traffic is much lighter over the three suggested areas than over western Cook County, the adverse effect of a 1,000-foot mountain in these areas would be much less than for the same mountain in Cook County.

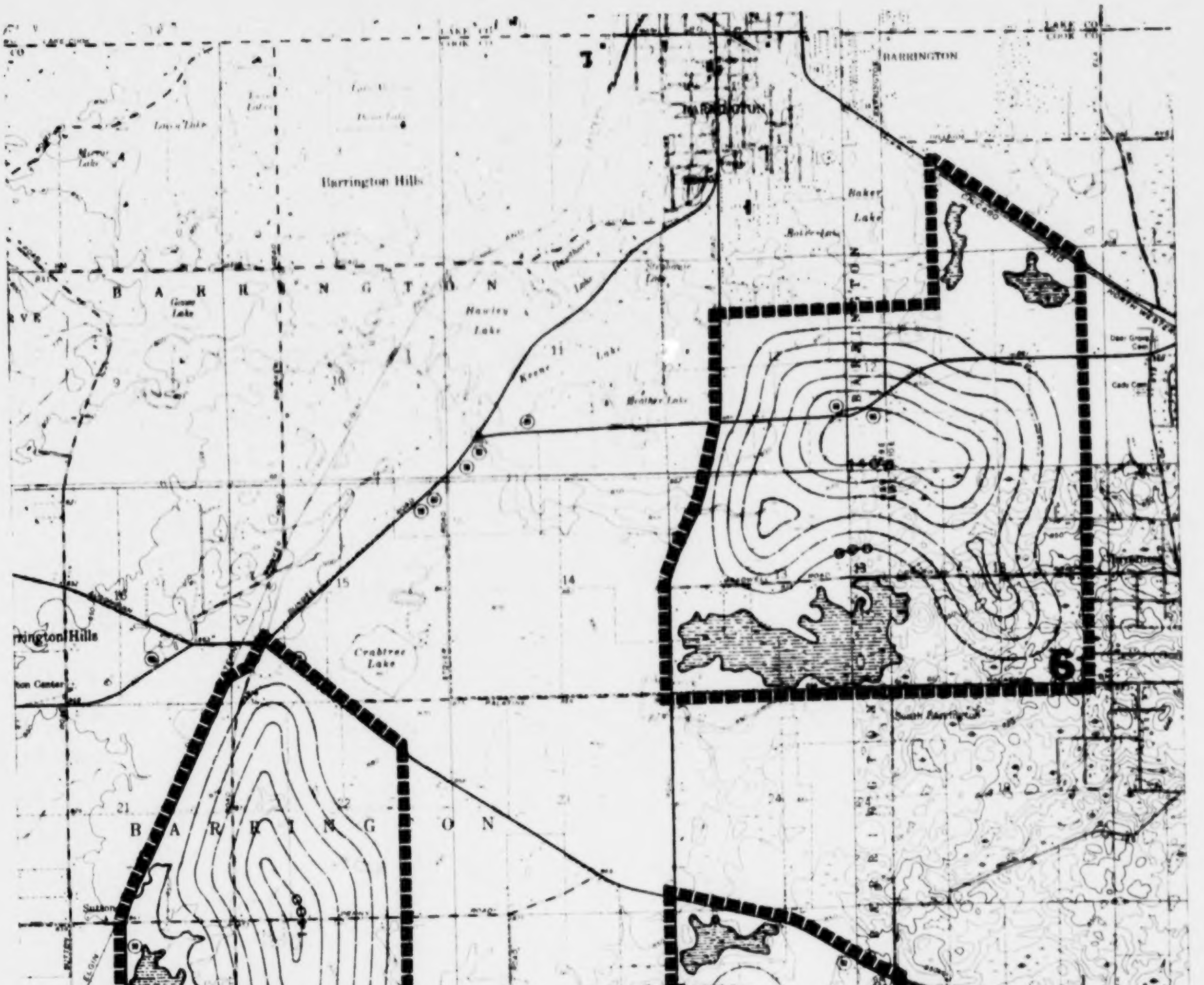
The west and southwest areas are near Interstate highways. The northwest and west areas are served by railroads. The southwest area is near the Illinois Waterway. Detailed investigations of transportation and other site factors would be required to ascertain the suitability of any of the three areas for use as a solid waste disposal site.


WISCONSIN
ILLINOIS
BOONE CO.
WINNEBAGO CO.
ROCKFORD
MC HENRY CO.
LAKE CO.
Lake Michigan
EVANSTON
ELGIN
OGLE CO.
SYCAMORE
DE KALB CO.
DE KALB
ST CHARLES
GENEVA
COOK CO.
CHICAGO
DU PAGE CO.
LEE CO.
KANE CO.
AURORA
LEMONT
CHICAGO SANITARY SHIP CHANNEL
CAL-SAG CHANNEL
KENDALL CO.
JOLIET
MINOOKA
CHANNAHON
PROPOSED SKI MOUNTAIN SITE
LA SALLE CO.
WILL CO.
ILLINOIS
INDIANA
LA SALLE
OTTAWA
MORRIS
MARSEILLES
SENECA
GRUNDY CO.
WILMINGTON
12
13
11
14
GARDNER
KANKAKEE
KANKAKEE CO.
DWIGHT
LIVINGSTON CO.
ODELL
NORTH
0 5 miles

SITES INVESTIGATED FOR SOLID WASTE MOUNTAIN AND RECREATION AREA

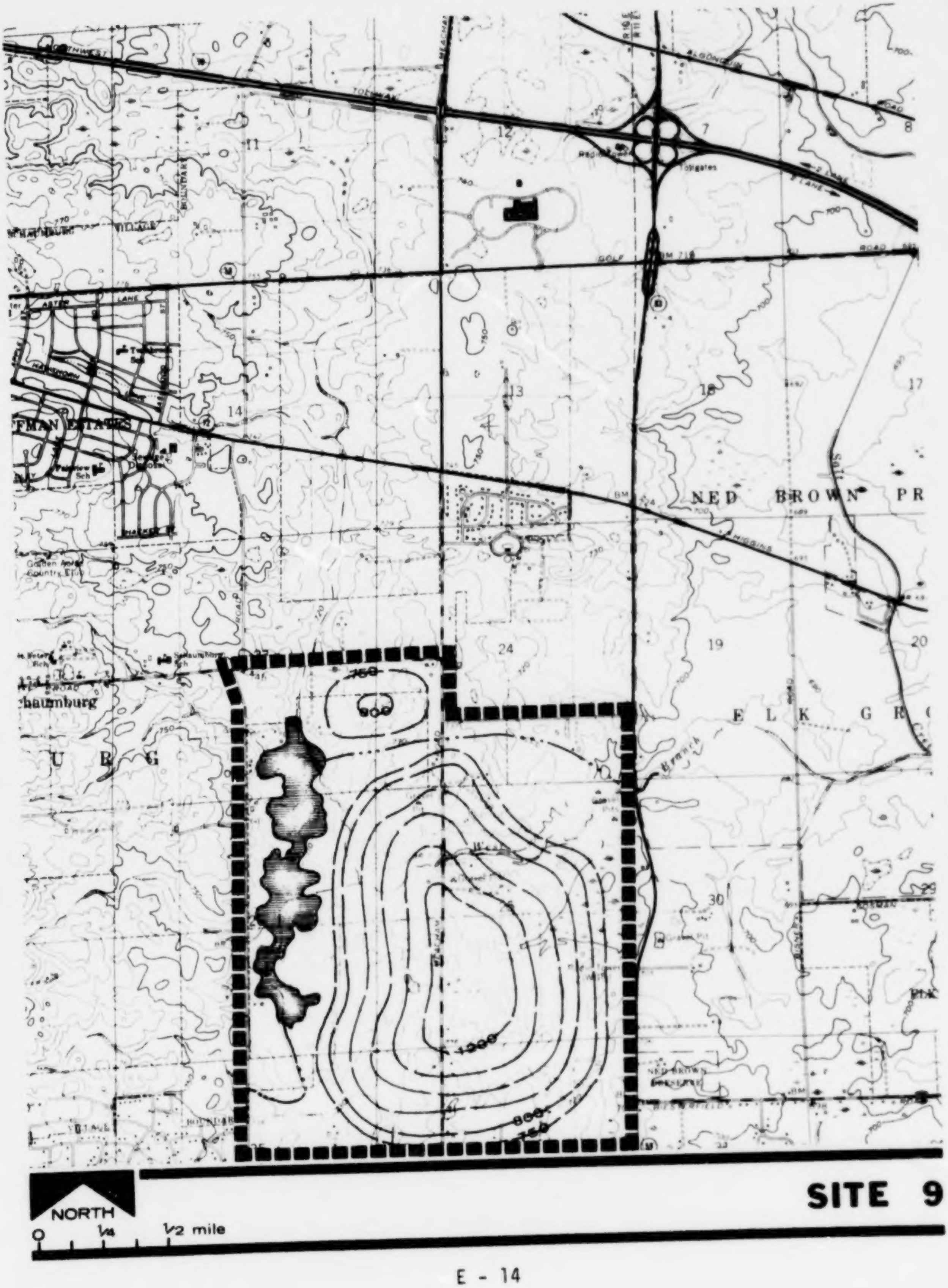

DIVERSION
SANITARY
DU PAGE CO
COOK CO
CANAL
CALUMET
SAG
14
13
FOREST PRESERVE
Sag Bridge
gas line
pipe line
23
24
25
26
Cog Hill Country Club
MOUNT VERNON MEMORIAL PARK
(CEMETERY)
Gleneagles Country Club
FOREST PRESERVE
ROAD
MC CARTY
power line
Substation
NORTH
0
1/4
1/2 mile
600
625
650
675
700
725

REVISED SITE 5


BARRINGTON
Barrington Hills
B A R R I N G T O N
B A R R I N G T O N
Crabtree Lake
Baker Lake
South Barrington
6
7
8
1400

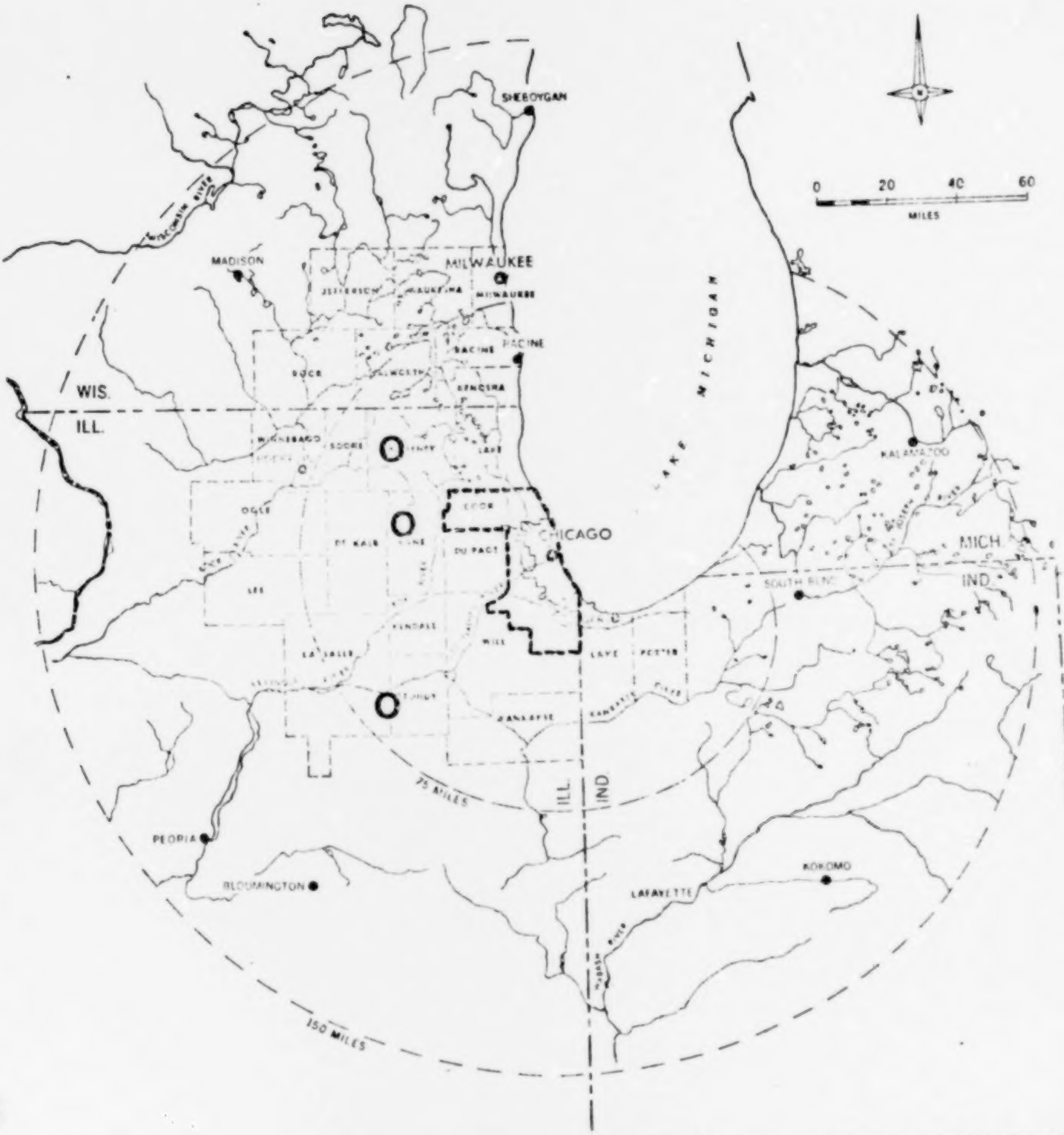
NORTH
0
½
1 mile

SITES 6, 7 & 8


NORTHWEST
TOLLWAY
ALGONQUIN
GOLF
ROAD
HIGGINS
FFMAN ESTATES
chaumburg
NED BROWN PR
E L K G R
U R G
Tollgates
Golden Acres Country Club
11
12
7
8
14
13
18
17
24
19
20
30
29
760
800
1000
800
760
NORTH
0
1/4
1/2 mile

SITE 9

THE CHICAGO REGION


SHEBOYGAN
0
20
40
60
MILES
WISCONSIN RIVER
MADISON
MILWAUKEE
JEFFERSON
WAUKESHA
MILWAUKEE
RACINE
RACINE
ROCK
WALWORTH
KENOSHA
LAKE MICHIGAN
WIS.
ILL.
WINNEBAGO
BOONE
LAKE
KALAMAZOO
OGLE
DE KALB
KANE
COOK
CHICAGO
DU PAGE
MICH.
IND.
SOUTH BEND
LEE
KENDALL
WILL
LAKE
PORTER
LA SALLE
ILLINOIS RIVER
KANKAKEE
KANKAKEE RIVER
75 MILES
ILL.
IND.
PEORIA
BLOOMINGTON
KOKOMO
LAFAYETTE
WABASH RIVER
150 MILES

O - NEAREST AREA FOR 1000 FT. HIGH SOLID WASTE MOUNTAIN WHICH WILL NOT CONFLICT SIGNIFICANTLY WITH AIR TRAFFI

DATA ON INVESTIGATED SITES FOR A 1000-FOOT HIGH SOLID WASTE MOUNTAIN AND RECREATION AREA NEAR COOK COUNTY AND ALONG ILLINOIS WATERWAY

As instructed by the Steering Committee on April 24, preliminary investigations have been made of potential solid waste mountain sites along the Illinois Waterway in the vicinity of Seneca, Illinois. Data are presented for five sites considered to have potential for construction of a 1,000-foot high solid waste mountain without causing serious hazard to air traffic. Considerations common to the sites are discussed under topic headings relating to site suitability. Detailed information peculiar to individual sites is presented in a tabulation following the general discussion. A general location map and maps of the individual sites follow the tabulation.

SIZE AND CONFIGURATION

Investigated ski mountain sites selected for consideration outside Cook County range in size from 6.6 to 12.1 square miles and all are larger than the largest site previously analyzed inside Cook County. The open, rural character of outlying Grundy and LaSalle Counties facilitated selection of potential sites with sufficient acreage to permit generous setbacks and protective buffers around the sites. In rapidly urbanizing Cook County, this amenity was less easily accommodated. Other advantages of larger sites are greater design flexibility, greater fill capacity, more latitude in the provision of recreational facilities and a better opportunity to retain existing natural features, such as drainage areas and tree cover. For example, Site 10, largest of the five sites, would be most adaptable to staged development, would permit an earlier realization of recreational potential, would be almost completely buffered from abuting land uses, and would permit almost total preservation of its rugged physical characteristics.

Each site will support a mountain with a height of at least 1,000 feet with maximum side slopes of 4 to 1. Generalized mountain configurations, shown on the attached site maps, were developed to roughly estimate the fill volume which could be supported reasonably on each site without destroying its most interesting natural assets. These should not be construed as final design concepts.

Estimated landfill volumes of the sites range from 1,093,000 to 1,858,000 acre-feet. Considering that the landfill space requirments of Cook County are estimated to average about 10,000 acre-feet per year over the next 20 year period, life of the sites for Cook County solid wastes appear to be in the range of 50 to 150 years.

EXISTING LAND USE AND STRUCTURES ON SITES

The principal land use on each of the investigated sites is agricultural. None of the sites is heavily populated. The smallest site (No. 11) contains 19 existing homes, while the largest site (No. 10) contains about 100. Site 10 includes a small cemetery which could be rehabilitated and retained in the final design concept. None of the sites presently contain commercial or industrial development. Sites 11 and 13 each contain a marina which could become an integral part of the proposed recreational facilities. None of the other sites contain major nonagricultrual land uses. Site 11 abuts the DuPont Seneca Works (fertilizer plant) on the north. Site 13 abuts a proposed Commonwealth Edison power plant on the Illinois River. An 8,000 acre tract is purportedly being acquired to the south of this site for a large cooling lake. The possibility of obtaining additional fill material from this proposed lake remains to be investigated. Site 14 abuts Starved Rock State Park on its north boundary.

Two gas lines, two power lines and a microwave path traverse Site 10. A powerline crosses Sites 11, 13, and 14. Site 13 is traversed by a microwave path along its east border. Only Site 10 is bisected by a major highway, U.S. 6, which would require rerouting.

LAND VALUE

Land values in Grundy and LaSalle Counties according to their respective County Assessors, average about $700 per acre for good farm land. Properties along the Illinois River are selling for prices ranging up to $1,500 per acre. Each of the investigated sites considered herein would cost less than any of the smaller sites considered earlier in Cook County.

ACCESSIBILITY

Sites 10, 11 and 13 have direct access to the Illinois River while Sites 12 and 14 are approximately ½ mile from the river bank. Major highway access to all the sites is via I-80. Highway access to each of the sites except Site 12 passes through an existing town. This disadvantage could be rectified more easily for Site 10 than for Sites 11, 13, and 14.

Sites 10, 11, and 12 have direct rail access, while Sites 13 and 14 have rail access within ½ mile and 1½ miles respectively. Site 10 has access to two railroads: the Chicago, Rock Island and Pacific and the Elgin, Joliet and Eastern. Other sites have access only to the Chicago, Rock Island and Pacific.

Approximate distances of the sites from Chicago Loop are:

Site	Highway Miles	Water Miles
10	53	53
11	87	73
12	82	73
13	87	73
14	100	94

LOCATION

All investigated sites are located along the Illinois River in northeastern Illinois. Sites 12, 13, 14 are located in LaSalle County. Site 11 straddles the LaSalle-Grundy County Line and Site 10 straddles the Grundy-Will County Line.

WATER POLLUTION POTENTIAL

Water pollution potential of the sites was evaluated from published reports of the Illinois Geological Survey, the State of Illinois Department of Business and Economic Development, and discussions with State Geological Survey personnel at the Naperville office.

Available information indicates that hydrogeological conditions are generally favorable for solid waste disposal at all of the investigated sites. Fifty to 100 feet of relatively impervious silty clay glacial till covers bedrock at each of the sites. Bedrock at Site 10 consists of the Maquoketa Group, a poor aquifer composed mainly of impervious shales which retards vertical movement of water to lower bedrock aquifers.

Bedrock at the other sites is the Carbondale formation of the Pennsylvanian System, a poor aquifer consisting mainly of shale with siltstone, sandstone, limestone and coal. Water in the Pennsylvanian System tends to be highly mineralized at greater depths.

DRAINAGE

Where possible, sites were selected in upper portions of watersheds to minimize the amount of runoff to be diverted. Ownership of all drainage area tributary to a site would be advantageous, as it would permit filling in a manner to facilitate drainage. Due to size of the sites, all will pose some drainage problems.

Drianage of Site 10 will be facilitated by high interior topography which drains in all directions to the exterior. Sites 11 through 14 each drain large outside areas to the river. Although more extensive grading may be required at these sites, initial investigations indicate adequate drainage can be accomplished. Drainage from Site 14 passes through Starved Rock State Park and will have to be carefully controlled to prevent inconvenience to the public.

FOUNDATIONS

Soil borings and other subsurface investigations will be required to determine whether subsurface formations will support a 1,000-foot solid waste mountain and to determine structural design parameters of the fill. Foundation conditions may control the maximum slope of the solid waste fill and, consequently, the height and configuration of the fill. Subsurface investigations will also provide useful hydrogeological data for evaluating water pollution potential and means for preventing or minimizing pollution.

OBSTRUCTION TO AIR TRAFFIC

The Federal Aviation Administration (FAA), Chicago office, delineated the general areas along the Illinois waterways where a 1,000-foot high solid waste mountain would conflict significantly with air traffic. Areas of conflict are indicated on the attached site location map. Potential disposal sites were selected in areas free of such conflict.

Any structure over 500 feet above existing ground is considered an obstruction to small aircraft on VFR navigation. However, the FAA indicated that approval is normally granted for structures erected in the public interest if they do not consitute a serious hazard to air traffic.

Prior to actual construction of a 1,000-foot high solid waste mountain on any of the investigated sites, an official notice of proposed construction should be filed with the FAA.

MAPS AND SITE DETAILS

Attached are a detailed tabulation of pertinent data for each of the five sites, a tabulation of advantages and disadvantages for each site, a location map, and maps of each of the sites showing a preliminary fill plan.

SITE 10

Advantages

1. Permits greater design flexibility than other sites.
2. Permits larger fill capacity than other sites.
3. Permits generous buffer strip around perimeter.
4. Permits more extensive preservation of existing natural amenities than other sites.
5. Is nearer Chicago Metropolitan Area than other sites.
6. Has direct water access.
7. Has direct rail access.
8. Has convenient access to two Interstate expressways.
9. Drainage conditions are more favorable than for other sites.
10. Minimum water pollution potential.

Disadvantages

1. Traversed by more existing utility lines than other sites (2 gas lines, 2 power lines, a microwave path).
2. Requires relocation of U.S. Route 6 in final design concept.
3. Existing highway access is through small towns.

SITE 11

Advantages

1. Has direct water access.
2. Has direct rail access.
3. Minimum water pollution potential.

Disadvantages

1. Highway access is circuitous and passes through an existing town.
2. Power line crosses site.

SITE 12

Advantages

1. Has future potential for excellent access to I-80 since site is only 1/2 mile south of I-80.
2. Access to site does not require haul through an existing town.
3. Minimum water pollution potential.
4. No major utility conflict.

Disadvantages

1. Rail and water access are not direct. Haul from barge and rail will conflict with U.S. Hwy 6.
2. Drainage conditions are not favorable.

SITE 13

Advantages

1. Has direct water access.
2. Minimum water pollution potential.

Disadvantages

1. Has poor existing rail access.
2. Highway access is circuitous and passes through an existing town.
3. Power line passes through site.

SITE 14

Advantages

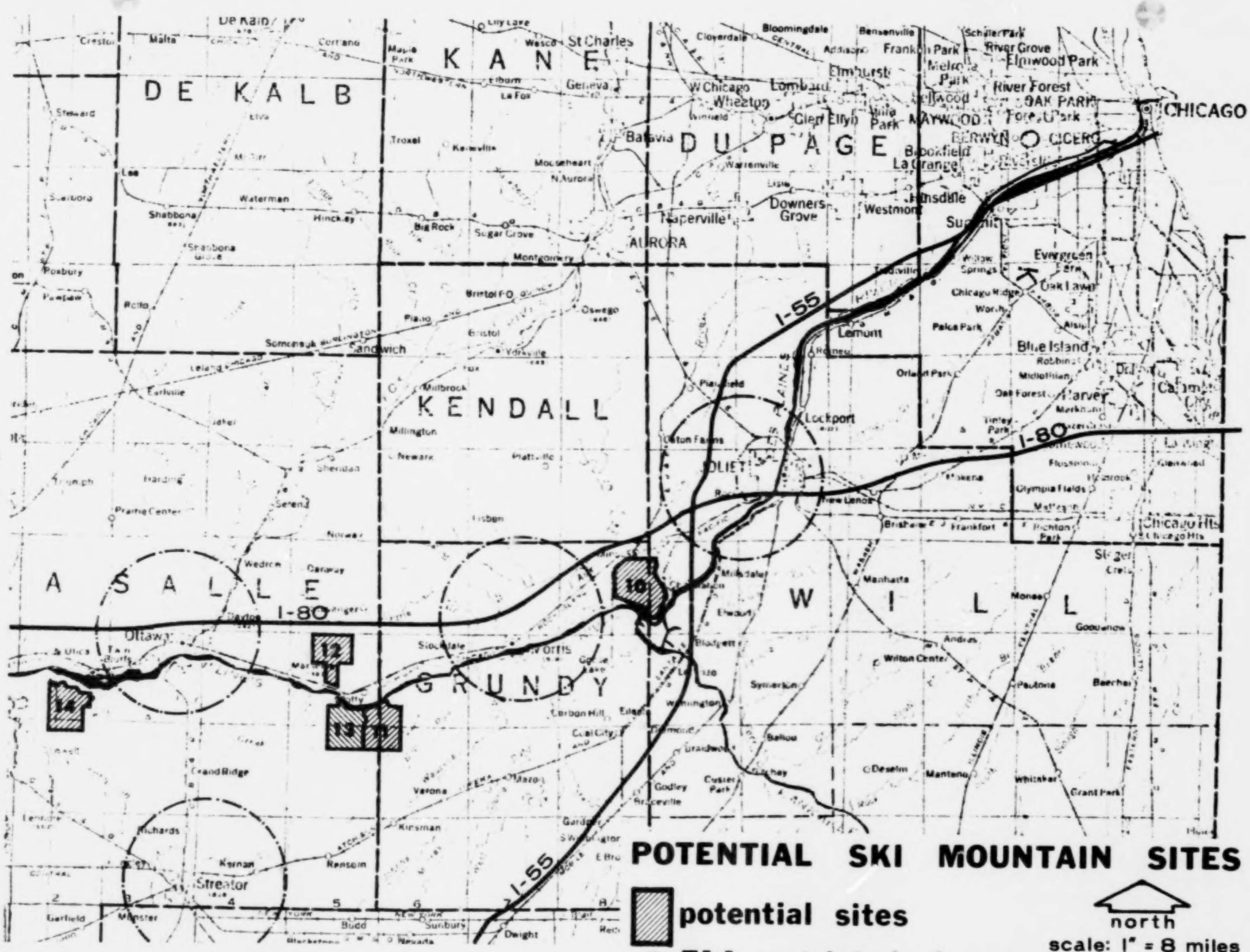
1. Minimum water pollution potential.
2. Could be integrated with existing park and recreational facilities.

Disadvantages

1. Requires truck haul through an existing town.
2. Further from solid waste generation points than other sites.
3. Power line passes through site.
4. Does not have direct access to the river. Haul from barges must pass through Starved Rock State Park.

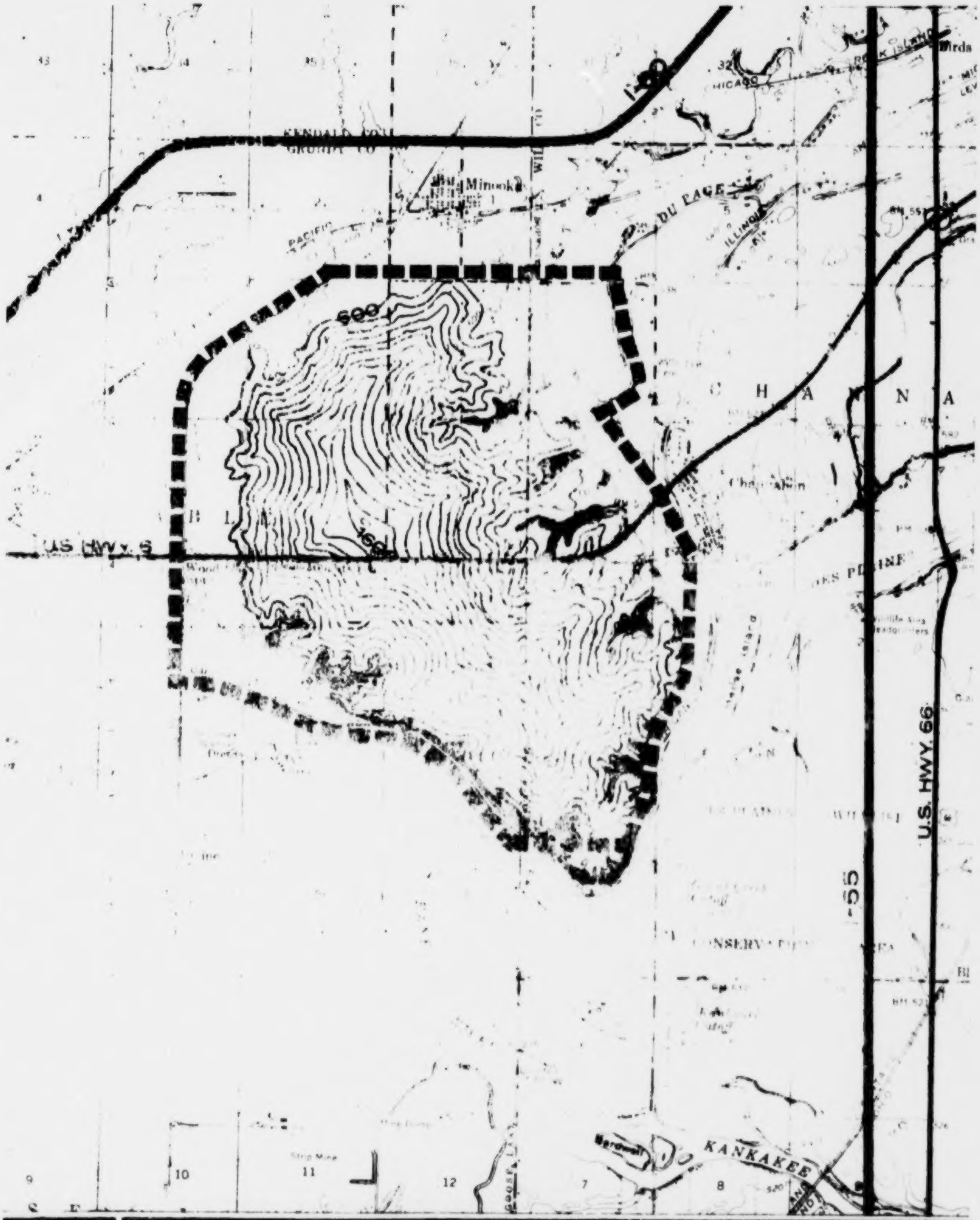
COMPARATIVE DATA ON INVESTIGATED SITES FOR SOLID WASTE MOUNTAIN AND RECREATION AREA
(All Numerical Values are Approximate)

	SITE 10	SITE 11	SITE 12	SITE 13	SITE 14
SIZE AND CONFIGURATION					
Area	7,300 acres - 11.4 sq mi	4,300 acres - 6.6 sq mi	5,200 acres - 8.1 sq mi	4,600 acres - 7.2 sq mi	4,800 acres - 7.6 sq mi
Dimensions	18,500' x 20,000'	15,000' x 12,500'	15,000 x 18,000'	15,000' x 13,500'	13,500' x 17,000'
Practical height of mountain	1,000'	1,000'	1,000'	1,000'	1,000'
Volume of mountain	1,858,000 acre-feet	1,093,000 acre-feet	1,429,000 acre-feet	1,208,000 acre-feet	1,128,000 acre-feet
EXISTING LAND USE AND STRUCTURES ON SITE					
Principal land use	Agricultural and open land	Agricultural and open land	Agricultural and open land	Agricultural and open land	Agricultural and open land
Single family residential	50	19	29	26	47
Other facilities	Cemetery, canal (I&M), abuts Will County Forest Preserve District	Marina, DuPont Fertilizer Plant abuts site on the east	None	Marine, Commonwealth Edison plant to abute site	Starved Rock State Park abuts site on north
Utilities	2 gas lines, 2 power lines, 1 microwave	1 power line	Microwave on each border	Microwave on east border, 1 power line	1 power line
Thoroughfares	US Rt. 6, County roads	County roads	County roads	County roads	County roads, Illinois Rt. 71
LAND VALUE					
Farm land	$700 per acre	$700 per acre	$700 per acre	$700 per acre	$700 per acre
Industrial sites on Illinois River	$1,000 - $1,500 per acre	$1,000 - $1,500 per acre	$1,000 - $1,500 per acre	$1,000 - $1,500 per acre	$1,000 - $1,500 per acre
ACCESSIBILITY					
Distance from Loop (hwy miles)	53	87	82	87	99.5
Distance from Loop (river miles)	53	73	73	73	94
Rail access	EJ&E on west edge; CRI&P 0.5 mile to northwest	CRI&P on northeast edge of site	CRI&P on south edge of site	CRI&P 0.5 mile north of site	CRI&P 1.5 miles north of site
Highway access	1 mile from I-80, 2 miles from I-55	7 miles from I-80 via US Hwy 6 & Illinois Rt. 170	7 miles from I-80 via US Hwy 6	7 miles from I-80 via US Hwy 6 & Illinois Rt. 170	3.5 miles from I-80 via Illinois Rt. 178
Water access	Illinois River	Illinois River	Illinois River	Illinois River	Illinois River
LOCATION					
County	Grundy; Will	LaSalle; Grundy	LaSalle	LaSalle	LaSalle
Township	Aux Sable; Channahon	Brookfield; Norman	Manlius	Brookfield	Deer Park
Proximity to municipalities	0.5 mile south of Minooka	1 mile southeast of Seneca	1 mile northwest of Seneca	1 mile southwest of Seneca	1.5 miles south of Utica 2 miles east of Oglesby
WATER POLLUTION POTENTIAL					
General evaluation	Relatively impervious glacial till and Maquoketa group over sandstone aquifer	Relatively impervious glacial till and Pennsylvanian system over sandstone aquifer	Relatively impervious glacial till and Pennsylvanian system over sandstone aquifer	Relatively impervious glacial till and Pennsylvanian system over sandstone aquifer	Relatively impervious glacial till and Pensylvanian system over poor sandstone aquifer
DRAINAGE					
General evaluation	Drainage generally favorable Land slopes away from site	Terrain may pose some problems. Drainage to Illinois River. Large area to be drained.	Drainage to Illinois River. Proximity to roads and railroad will necessitate careful study.	Drainage to Illinois River. Terrain is rougher in nature. Planned drainage will be necessary.	Careful drainage design required to protect existing state park.
FOUNDATIONS	Detailed study needed	Detailed study needed	Detailed study needed	Detailed study needed	Detailed study needed
OBSTRUCTIONS TO AIR TRAFFIC					
Probable obstruction to 1,000' Mountain	Not indicated by preliminary investigation	Not indicated by preliminary investigation	Not indicated by preliminary investigation	Not indicated by preliminary investigation	Not indicated by preliminary investigation
Distance from nearest airport	7 miles from Morris	12 miles from Morris	11 miles from Ottawa	11 miles from Ottawa	9 miles from Ottawa
Further evaluation needed	Notice to FAA required	Notice to FAA required	Notice to FAA required	Notice to FAA required	Notice to FAA required



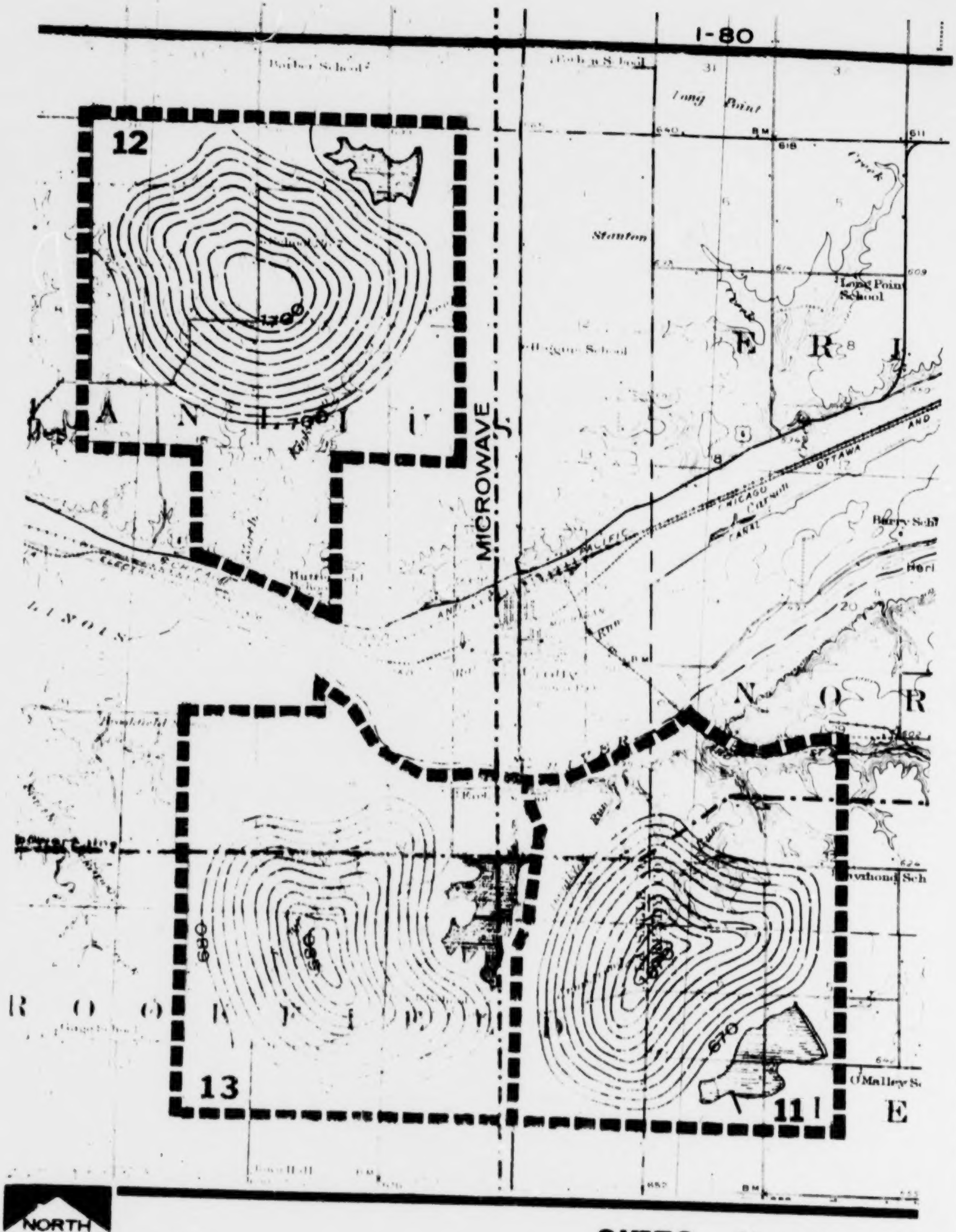
POTENTIAL SKI MOUNTAIN SITES

potential sites
FAA restricted airspace
north
scale: 1" = 8 miles
DE KALB
KANE
DU PAGE
KENDALL
LA SALLE
GRUNDY
WILL
CHICAGO
AURORA
JOLIET
I-55
I-80
10
12
13
14
Ottawa
Streator
Lockport
Naperville
Lemont
Blue Island
Harvey
Wheaton
Downers Grove
Oak Park
Cicero
Berwyn
Maywood
Elmhurst
Lombard
Hinsdale
La Grange
Chicago Hts
Morris
Sandwich
Geneva
St Charles
Batavia
Dwight

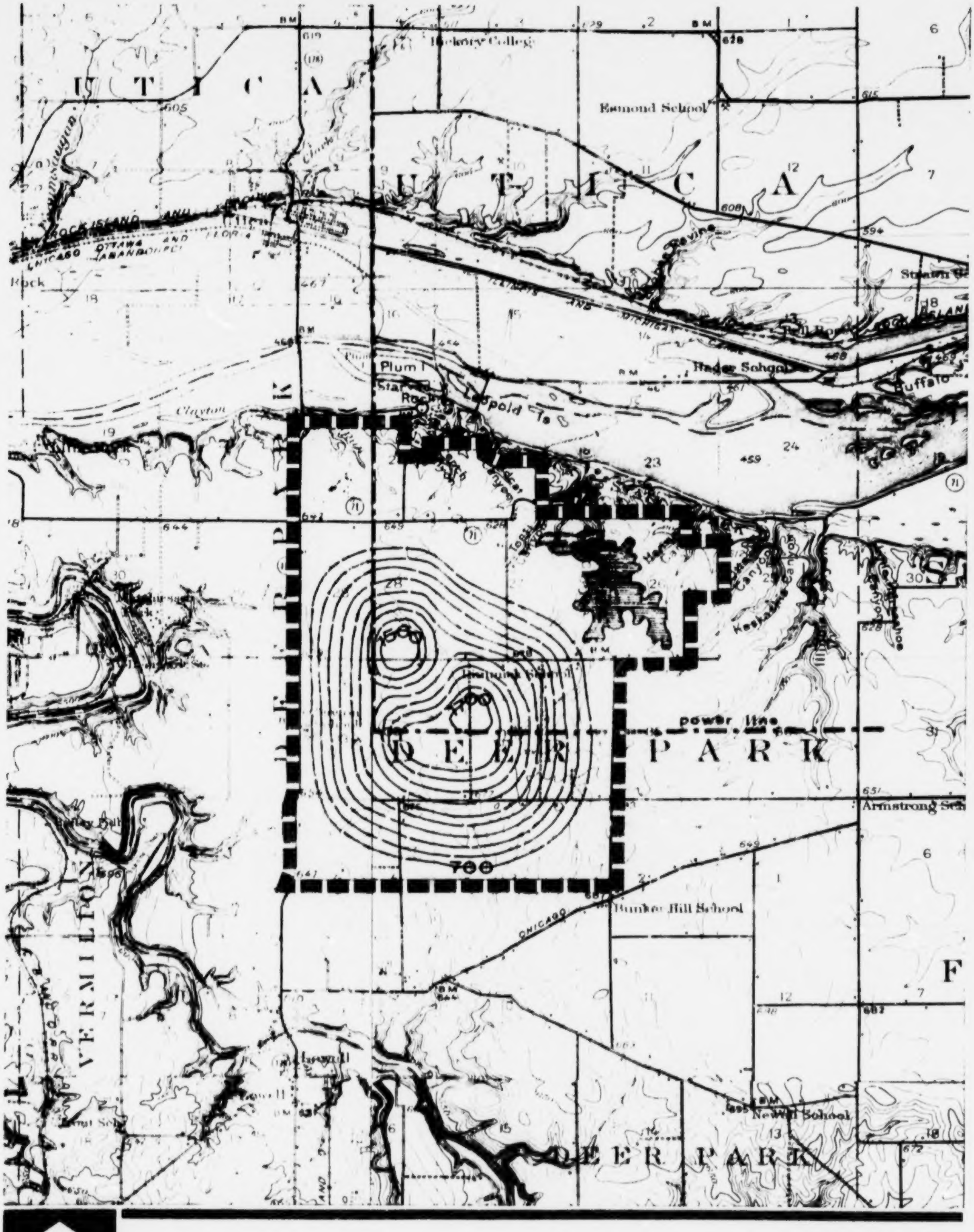

I-80
KENDALL CO
GRUNDY CO
Minooka
PACIFIC
DU PAGE
ILLINOIS
ROCK ISLAND
CHICAGO
600
500
US HWY. 6
C H A N N A
Channahon
DES PLAINES
CONSERV
U.S. HWY. 66
I-55
KANKAKEE
Strip Mine
9
10
11
12
7
8

NORTH
0
1 mile

PROPOSED FINAL TOPOGRAPHY OF SKI MOUNTAIN ON SITE 10


I-80
MICROWAVE
12
13
11
1700
680
670
Long Point
Stanton
Long Point School
NORTH
0
1 mile

SITES 11, 12 & 13


UTICA
Hickory College
Esmond School
ROCK ISLAND AND
CHICAGO OTTAWA AND
Plum I
Starved Rock
Leopold Is
Clayton
Buffalo
Canyon
Keskaskia Canyon
power line
DEER PARK
Armstrong Sch
Bunker Hill School
CHICAGO
Newell School
VERMILLION
700
NORTH
0
1 mile

SITE 14

APPENDIX G

CORRESPONDENCE REGARDING SITE 10

BLACK & VEATCH
CONSULTING ENGINEERS

AREA CODE 816
TEL. 361-7000

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS: P. O. BOX NO. 8405
KANSAS CITY, MISSOURI 64114

Metropolitan Sanitary District
of Greater Chicago
Solid Waste Disposal Study
Project 5180

July 8, 1970

Mr. Frank Dalton
Metropolitan Sanitary District
of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

Dear Mr. Dalton:

Although we discussed the proposed ski mountain site near Minooka (Site 10) with the Federal Aviation Administration (FAA) Chicago Area Office, and received an unofficial opinion that a 1000 foot high mountain at this site would not be a significant hazard to air traffic, we believe FAA Form 7460-1 should be submitted on this site as was done for the proposed Lemont Site. Accordingly, we have filled in the appropriate information on a copy of FAA Form 7460-1 and are enclosing this form and blank copies of it.

The data shown on the form are merely our suggestions and may be modified as you see fit.

Please complete the blank form and submit it, together with a request for an immediate study, to:

Mr. M. L. Kolhler, Chief
Air Traffic Branch
FAA Chicago Area Office
3166 Des Plaines Avenue
Des Plaines, Illinois 60018

We would appreciate receiving copies of all correspondence between the Metropolitan Sanitary District and the FAA on this matter, so that we will be apprised of the FAA findings.

Very truly yours,

BLACK & VEATCH

F E Kirkpatrick
F. E. Kirkpatrick

FEK:mm
Enclosure

SKI-MOUNTAIN STEERING COMMITTEE

100 E. ERIE STREET – CHICAGO, ILLINOIS 60611 – PHONE 312-787-8900

July 16, 1970

PROJECT DIRECTOR

Frank E. Dalton
The Metropolitan Sanitary District
of Greater Chicago

ORGANIZATIONS REPRESENTED

The Metropolitan Sanitary District
of Greater Chicago

City of Chicago
Bureau of Sanitation

Cook County Forest Preserve
District

Cook County Council
of Governments

State of Illinois
Dept. of Conservation

State of Illinois
Dept. of Business and
Economic Development

United States Public
Health Service

American Public Works
Administration

Northeastern Illinois
Planning Commission

Robert Thorsen
Attorney

City of Evanston

City of Des Plaines

Village of Arlington Heights

Village of Alsip

Village of Glenview

Village of LaGrange

Village of Oak Lawn

Village of Oak Park

Village of Park Forest

Village of Skokie

Village of Wilmette

Mr. M. L. Kolhler, Chief
Air Traffic Branch
FAA Chicago Area Office
3166 DesPlaines Avenue
Des Plaines, Illinois 60018

Dear Mr. Kolhler:

The proposed Ski Mountain site near Minooka, Illinois, is being studied as the solution to the solids disposal problem of Cook County.

To comply with FAA regulations, the Metropolitan Sanitary District of Greater Chicago is submitting FAA Form 7460-1 for your review and comments. Since design work cannot proceed without this information, we would appreciate your comments at your very earliest convenience.

Thank you for your earliest consideration of this project.

Very truly yours,

Frank E. Dalton
Assistant Chief Engineer and
Project Director

FED:jn

Enclosure

U. S. GOVERNMENT PRINTING OFFICE: 1969-359-038

Before completing this form it is recommended that the following excerpts from the Federal Aviation Regulations, Part 77, Subchapter B below be reviewed.

USE BACK OF THIS SHEET AS WORKSHEET

Form Approved. Budget Bureau No. 04-R0001.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

1. NATURE OF STRUCTURE *(Complete both A and B below)*

A. *(Check one)* ☒ NEW CONSTRUCTION ☐ ALTERATION

B. *(Check one)* ☒ PERMANENT ☐ TEMPORARY *(State length of time)* ________ Mos.

2. NAME AND ADDRESS OF INDIVIDUAL, COMPANY, CORPORATION, ETC. PROPOSING THE CONSTRUCTION OR ALTERATION *(Number, Street, City, State and Zip Code)*

TO
The Metropolitan Sanitary District
of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

TO BE COMPLETED BY FAA

AERONAUTICAL STUDY NO.

FAA WILL COMPLETE AND RETURN THIS FORM IF ONE OR MORE OF THE FOLLOWING IS APPLICABLE, OTHERWISE SEPARATE ACKNOWLEDGEMENT WILL BE ISSUED.

A. A STUDY OF THIS PROPOSAL HAS DISCLOSED THAT THE PROPOSED STRUCTURE:

☐ DOES NOT REQUIRE A NOTICE TO FAA.

☐ WOULD NOT EXCEED ANY STANDARD OF PART 77 AND WOULD NOT BE A HAZARD TO AIR NAVIGATION.

☐ SHOULD BE MARKED AND LIGHTED PER FAA "OBSTRUCTION MARKING AND LIGHTING" ADVISORY CIRCULAR 70/7460-1.

☐ REQUIRES SUPPLEMENTAL NOTICE. NOTICE FORM (FAA FORM 117-1) ENCLOSED.

B. COPY SENT TO FCC? ☐ YES ☐ NO

REVIEWING OFFICER

DATE

3. TYPE AND COMPLETE DESCRIPTION OF STRUCTURE

Solid waste mountain and recreation area rising approximately 1000 feet above existing ground. Base of mountain would be 6000 to 8000 feet wide. The mountain would form a ridge or series of peaks 2 to 3 miles long.

4. LOCATION OF STRUCTURE

A. COORDINATES *(To nearest second)*

LATITUDE °	'	"	LONGITUDE °	'	"
41	26		88	15	

B. NEAREST CITY OR TOWN, AND STATE
Minooka, Illinois

(1) DISTANCE FROM 4B: one MILES

(2) DIRECTION FROM 4B: South

C. NAME OF NEAREST AIRPORT, HELIPORT, OR SEAPLANE BASE: Joliet Municipal; Morris Municipal

(1) DISTANCE FROM NEAREST POINT OF 4C: 6 miles; 6 miles

(2) DIRECTION FROM AIRPORT: SW; E

D. *DESCRIPTION OF LOCATION OF SITE WITH RESPECT TO HIGHWAYS, STREETS, AIRPORTS, PROMINENT TERRAIN FEATURES, EXISTING STRUCTURES, ETC. (Attach a highway, street, or any other appropriate map or scaled drawing showing the relationship of construction site to nearest airport(s). If more space is required, continue on a separate sheet of paper and attach to this notice.)*

Bounded on east by DesPlaines River and DuPage River. Bounded on southwest by Dresden Lock and Dam. Bounded on west by E J&E Railroad. Straddles US Highway 6. See attached maps showing site boundaries and a preliminary concept of the mountain.

5. HEIGHT AND ELEVATION *(Complete A, B and C to the nearest foot)*	
A. ELEVATION OF SITE ABOVE MEAN SEA LEVEL	650±
B. HEIGHT OF STRUCTURE INCLUDING APPURTENANCES AND LIGHTING *(if any)* ABOVE GROUND, OR WATER IF SO SITUATED	1000'
C. OVERALL HEIGHT ABOVE MEAN SEA LEVEL *(A + B)*	1650±

6. WORK SCHEDULE DATES

A. WILL START: 1973±

B. WILL COMPLETE: 2000±

7. OBSTRUCTION MARKINGS – The completed structure will be:	YES	NO
A. MARKED AS SPECIFIED IN THE FAA ADVISORY CIRCULAR 70/7460-1, OBSTRUCTION MARKING AND LIGHTING		
B. LIGHTED AS SPECIFIED IN THE FAA ADVISORY CIRCULAR 70/7460-1, OBSTRUCTION MARKING AND LIGHTING	X	

I HEREBY CERTIFY that all of the above statements made by me are true, complete, and correct to the best of my knowledge.

8. NAME AND TITLE OF PERSON FILING THIS NOTICE *(Type or Print)*
Frank E. Dalton
Assistant Chief Engineer

9. SIGNATURE *(In ink)*

10. DATE OF SIGNATURE: 7/14/70

11. TELEPHONE NO. *(Precede with area code)*: 312, 787-1664

Persons who knowingly and willfully fail to comply with the provisions of the Federal Aviation Regulations Part 77 are liable to a fine of $500 for the first offense, with increased Penalties thereafter as provided by Section 902(a) of the Federal Aviation Act of 1958 as amended

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

CHICAGO AREA OFFICE
3166 DES PLAINES AVENUE
DES PLAINES, ILLINOIS 60018

31 AUG 1970

Mr. Frank E. Dalton
Assistant Chief Engineer
The Metropolitan Sanitary District
of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

Dear Mr. Dalton:

We have completed an aeronautical review of the proposed solid waste ski-mountain and recreation area in accordance with the information submitted to us in the FAA Form 7460-1, Notice of Proposed Construction or Alteration, dated 14 July 1970. The review was conducted within our organization and was not circularized to aviation interests as agreed upon during your telephone conversation with Mr. Keith Potts of our office on 30 July 1970.

Our study disclosed that the proposed ski-mountain would have the following effect upon present aeronautical operations and procedures:

1. It would require that the minimum en route altitude of Federal Airways V171, V429 and V38 be increased from 2500 feet MSL to 2700 feet MSL.

2. It would require that the minimum obstruction clearance altitude of Federal Airways V171, V429 and V38 be increased from 2100 feet MSL to 2700 feet MSL.

3. It would be located immediately adjacent to the Illinois River, which is a prominent, readily identifiable landmark that may constitute a regularly used Visual Flight Rules route. As previously pointed out in our comments concerning the proposed ski-mountain, the public has the right of freedom of transit through the navigable airspace in accordance with Public Law 85-726, Federal Aviation Act of 1958. Our procedures dictate that a proposed object would have an adverse effect upon air navigation if it would exceed a height of 500 feet above the surface at its site and would be located within two statute miles of any regularly used Visual Flight Rules route identifiable by prominent landmarks suitable as visual aids to air navigation. Further study including aeronautical circularization of the proposal to all known interested persons would be necessary in order to determine if the Illinois River is or is not a Visual Flight Rules route.

Therefore, we request that at such time as plans for the ski-mountain become more definite, that you notify us and at that time, we will initiate a full aeronautical study and issue an official airspace determination.

If we may be of any further assistance or service in this matter, please do not hesitate to contact us.

Sincerely,

M. L. KOEHLER
Chief, Air Traffic Branch, CHI-500

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION
WILLIAM H. ROBINSON, DIRECTOR SPRINGFIELD
BOARD OF NATURAL RESOURCES AND CONSERVATION
CHAIRMAN - WILLIAM H. ROBINSON
GEOLOGY - - - LAURENCE L. SLOSS
CHEMISTRY - - - - ROGER ADAMS
ENGINEERING - ROBERT H. ANDERSON
BIOLOGY - - - - - THOMAS PARK
FORESTRY - - CHARLES E. OLMSTED
UNIVERSITY OF ILLINOIS
DEAN WILLIAM L. EVERITT
SOUTHERN ILLINOIS UNIVERSITY
PRESIDENT DELYTE W. MORRIS

ILLINOIS STATE GEOLOGICAL SURVEY
NATURAL RESOURCES BUILDING
PEABODY EAST OF SOUTH SIXTH
URBANA, ILLINOIS 61801
TELEPHONE 217 344-1481
JOHN C. FRYE, CHIEF

August 31, 1970

RECEIVED
SEP 3 1970
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

Mr. C. E. Clark, Chief
Bureau of Solid Waste
Environmental Protection Agency
Springfield, Illinois 62706

Dear Mr. Clark:

In re Grundy County - Solid Waste Disposal
Minooka/Metropolitan Sanitary District
of Greater Chicago

This is in response to your request of July 27, 1970, for a general summary of the hydrogeologic conditions and an opinion regarding the suitability of a large landfill site in Grundy and Will Counties south of Minooka. In addition to office studies of well records in the area, the site was field checked by Keros Cartwright and Frank B. Sherman of this office on August 20, 1970.

The site consists of approximately 12 square miles, eight in Grundy County (all or parts of Sections 10-15 and 22-26, T. 34 N., R. 8 E.), and four in Will County (all or parts of Sections 7, 17-20, and 30, T. 34 N., R. 9 E.), at the confluence of the Kankakee and Des Plaines Rivers where they form the Illinois River. Also the DuPage River flows along the east edge until it enters the Des Plaines River. The site itself is mostly restricted to the upland till surface and overlooks the rivers on over half of the margin of the site.

The bedrock consists principally of the Maquoketa Formation, which in this area is mostly dolomite rather than shale; however, shale is generally found at the base of the formation. A few remnants of the thin Pennsylvanian (Coal Measures) are present. Underlying the Maquoketa is the Galena-Platteville dolomite which is in turn underlain by the St. Peter sandstone.

The glacial drift overlying the bedrock is variable in thickness and character. In the northeastern part of the site between Minooka and Channahon the drift is relatively thin, less than 50 feet thick; in the DuPage River Valley gravel is present but the rest of the area is mostly clayey till. In the Aux Sable Creek lowland sandy deposits are also found near the surface, but are underlain by rather thick, clayey till. In a large part of the site the glacial drift is 100 to 150 feet thick. Where this thick, the upper 80 to 100 feet is clayey till which is underlain by permeable sand and gravel. Sometimes more than one gravel zone is present.

Water supplies in the area are mostly obtained from drilled wells finished in the bedrock, although undoubtedly a number of old dug wells are present in the area which are still in use. The most productive horizon is the St. Peter sandstone, encountered at an average depth of about 500 feet. However, both the Maquoketa and Galena-Platteville are productive and most domestic supplies are finished in these formations at 150 to 130 feet. The gravel in the glacial drift probably is also highly productive where present. However, most wells are finished in the underlying rock because of ease of well construction (and therefore lower costs); some wells finished in the rock immediately below the gravel undoubtedly draw water from the gravel also.

We have no records of a public water supply at Channahon; apparently water is obtained from individual wells. Minooka obtains water from wells 640 feet deep; the St. Peter sandstone is the principal producing zone, although the holes are open to the shallower dolomites. The drift at this site is only 40 to 45 feet thick. Water levels in the wells in this area average about 80 to 100 feet below land surface.

It is impossible to give an overall opinion of the site as a landfill project of the dimensions of this project. Obviously a considerable amount of drilling would have to be done to better evaluate the thickness and character of the glacial drift. From the available data it appears that the area is, in general, favorable as a landfill site. My main concern would be for the northeast area where the drift appears to be thin and deep trenching could strip most, if not all, the protection from underlying dolomite aquifers, which then could transmit pollutants large distances (dolomites, like limestones, transmit water through fractures which afford little or no filtering). Also the shallow sand in the Aux Sable Creek area could possible be affected. There is ample water available from the deep St. Peter sandstone to provide an alternate supply should it be necessary to provide for one.

Considerable care by an experienced well plugging company would have to be taken to plug all wells penetrating the aquifer in the area as they make a direct connection between the surface and aquifers. Location of all wells may be somewhat difficult and operation of the landfill may reveal wells not located during the original plugging operations, and appropriate care must be taken to plug these when found.

Very truly yours,

Keros Cartwright
Assistant Geologist
Section of Ground-Water Geology
and Geophysical Exploration

NGPL

J. E. THOMPSON
VICE PRESIDENT · ENGINEERING

122 SOUTH MICHIGAN AVE
CHICAGO, ILLINOIS 60603
PHONE: 312/431-7630

October 9, 1970

REFERRED TO

JNA
CRB
DLS
FKB
HHS
HHOJF
LJR
RLB
WSB
DEC
WRP
HBB
DMD
EGF
JFF

WEF
WRG
CLH
DIH
FER
WEL
WNL
CAM
ERM
VDM
RUM
RJM
WEN
ACO
ACP

DPF
JNS
RWS
RES
TDS
WDS
TMT
REV
DJW
JLW
LEW
LWW
RHY

EFB
LWB
AVF

EAF
POH
REL

JHR
TBR
NTV

Black and Veatch
Consulting Engineers
1500 Meadow Lake Parkway
Kansas City, Missouri 64114

Attention: Mr. H. E. Lutz

RE: Metropolitan Sanitary District
of Greater Chicago
Solid Waste Disposal Study
(Ski Mountain)
Project Number 5180

Gentlemen:

As requested, we have prepared a cost estimate based on relocating our three pipelines to the perimeter of the proposed disposal site south of the town of Minooka.

We have determined that the route proposed in your original correspondence is generally acceptable to us and was used in preparing the estimate. In utilizing this routing, approximately 3.7 miles each of existing three lines would be replaced with 4.75 miles of relocated lines.

Existing facilities consist of one 30-inch and two 36-inch pipelines. Because of the increased length of the relocated lines compared with the existing facilities, an increased pressure drop of 4 psi will result if pipe of the same diameter is used. To eliminate this pressure drop and the resulting loss of capacity, the replacement pipe must consist of three 36-inch lines.

In preparing the estimate, it has been assumed that the existing lines will be abandoned in place. If it is determined at the time of relocation that it would be economical to salvage these lines, this would then be done. This aspect cannot be determined at this time.

Also, it has been assumed that we will not acquire new right-of-way but will utilize Sanitary District right-of-way on the periphery of the site.

Black and Veatch
Page 2 of 2
October 9, 1970

Based on three 36-inch lines, each 4.75 miles in length we have estimated a total cost of $3,580,000 or approximately $48 per lineal foot. This figure assumes 1971 construction and material costs.

Data on these new facilities are as follows:

Pipe	36" O.D. x .330" W.T. X65
Design Pressure	858 psig (same as existing)
Function	Natural Gas Transmission

We hope this information will aid you in the feasibility study and if you should require additional information, please contact this office.

Very truly yours,

NATURAL GAS PIPELINE COMPANY OF AMERICA

J. E. Thompson

Commonwealth Edison Company
72 WEST ADAMS STREET ★ CHICAGO, ILLINOIS

Address Reply to:
POST OFFICE BOX 767 ★ CHICAGO, ILLINOIS 60690

January 25, 1971

Mr. F. E. Kirkpatrick
Black and Veatch
Consulting Engineers
1500 Meadowlake Parkway
P.O. Box No. 8405
Kansas City, Missouri 64114

Dear Mr. Kirkpatrick:

This is to confirm my telephone conversation with Mr. Yancy regarding an estimate of costs we could incur in relocating facilities to clear the Metropolitan Sanitary District of Greater Chicago-Ski Mountain Project 5180, Site No. 10. I gave Mr. Yancy a figure of $5,000,000 for the cost of relocating existing and planned facilities through the area exclusive of any alternate right-of-way costs.

I superimposed on your attached print the location of our rights-of-way, together with a legend indicating the number of existing and planned transmission lines and their voltage through the various segments. The planned lines are those which are currently being engineered for early construction.

The estimate is contingent on our being able to install the 765-KV tower line along an alternate route as indicated by dashed red line. If this line had to be rerouted in a manner involving more angles or, if it had to be rerouted outside the area completely, the estimate would be substantially increased.

If you desire any further information, please let me know.

Yours truly,

A. R. Heidecke
Asst. Director of Real Estate

ARH:cb

Illinois Bell
Telephone Company

7 East Clinton Street
Joliet, Illinois 60431
September 30, 1970

Mr. H. E. Lutz
Black & Veatch, Consulting Engineers
P. O. Box No. 8405
Kansas City, Missouri 64114

Dear Sir:

This is in response to your request regarding the solid waste disposal study near Channahon, Illinois (Project No. 5180). The location and height of this waste deposit would interfere with our microwave and other outside plant facilities.

We have estimated the cost of relocation and adjusting our facilities based on current cost at $460,000.

Very truly yours,

District Engineering Manager

DLM:jb

WOODWARD - CLYDE & ASSOCIATES K-70-5

• 600 EAST 95TH STREET • KANSAS CITY MISSOURI 64131 • TELEPHONE EM 3 3663
Consulting Soil and Foundation Engineers

OAKLAND, CALIF.
DENVER, COLO.
OMAHA, NEB.
KANSAS CITY, MO
PHILADELPHIA, PA
CLIFTON, N.J.
ST. LOUIS, MO.
SAN DIEGO, CALIF
SAN JOSE, CALIF.

NEW YORK, N.Y

June 29, 1970

Black & Veatch
1500 Meadowlake Parkway
Kansas City, Missouri

Attention: Mr. L. W. Bremser

PRELIMINARY EXAMINATION
SOLID WASTE DISPOSAL CONCEPT
COOK COUNTY, ILLINOIS

Gentlemen:

This letter confirms verbal presentations made to you and your engineers on June 24. We have, at your request, identified probable geologic subsurface conditions using reference information you made available plus our own library resources. A list of the information available is attached in the bibliography. The object of this review was to provide the basis for preliminary findings relating these conditions to foundation performance of the proposed construction. The scope of all work is preliminary. The data available for review has been of a geologic character. Within this site, denoted Site 10, no borings have been performed and no laboratory test results of an engineering nature are available. The only wells for which data are available have been extended into bedrock; logs in the surficial deposits are not available.

To provide perspective to our findings the scope of proposed construction is described. The general geologic setting, with possible variations and expected important characteristics, is described and subsequently the findings and recommendations are presented.

PROPOSED CONSTRUCTION

Proposed construction envisions an ultimate 1000 foot maximum sanitary landfill constructed with average outboard slopes of 4 (horizontal) to 1 (vertical) covering portions of twelve sections, ten of which are in Grundy County and two in adjacent east Will County. The site is generally bounded by the DuPage River and the Des Plains River on the east and the area of confluence with the Kankakee River to the south. (Below these watersheds it is known as the Illinois River.) As generally visualized, the soil material present within this area would be used as cover material for the landfill layers. Assuming a 10 percent proportion of soil to total mass, it is estimated that some 50 feet of excavation throughout the area of landfill mass would be necessary. To provide a base for permanent construction, a relatively non-yielding central core area has been proposed. A required width of 50 feet at the crest is necessary. Phased construction is desired. During construction portions of the site would be used desirably for recreation and ultimately the area would be a ski mountain site. The time to ultimate development is estimated at one hundred years.

GEOLOGIC SETTING

Our review of the available geologic literature suggests this site is underlain by bedrock at depths of 50 to 100 feet. The uppermost bedrock unit is likely shale of the Maquoketa formation. Outcrops of overlying dolomitic rocks are present short distances to the east particularly along the Des Plains River. The shale beds of this unit are low pervious, generally not productive of groundwater, although included dolomitic beds are sometimes low yield aquifers. The bedrock surface is overlain by glacial deposits of which the most prominent feature is the Minooka moraine. This is an interglacial terminal moraine oriented north-south. It terminates at the confluence of the rivers bounding this site. This type glacial feature is normally composed of a large variety of grain sized materials including everything from boulders down to and including clay till. As mapped, this feature extends areally over the central portion estimated at approximately two-thirds of the construction area. It was constructed by the glacial ice sheet at a point in its recession when the advancing ice and melting resulted in a virtual standstill of the ice advance. This resulted in the production of accumulation of glacial debris in which the local production and distribution of melt water determined the character of the deposits. As mapped by Thornburn the surface materials are described as "dark colored moderately slowly permeable soils from thin loess on silty clay loam till." Figure 6 of groundwater report number 1 shows a sand content in the Minooka moraine. Bergstrom, in his "Disposal of Wastes" paper, quotes previous writers as saying, "the piezometer response to precipitation at various depths in glacial till suggests that some groundwater movement takes place rather quickly through joints rather than through intergranular openings." All indications considered, we anticipate the Minooka moraine is an indurated mass of variable deposits, predominantly a silty clay till but including, very likely, important quantities of granular materials in some positions with unknown configurations.

Subsequent to deposition of the Minooka moraine, the area was inundated to a maximum level of about elevation 640 by fresh water. The water level fluctuated but was held in the area by a natural dam south and west of the area under consideration. This inundation is known as the Lake Wauponsee occurrence. Deposits of Lake Wauponsee, as described in the literature are thin, 4 to 6 feet being the only stated reference. These materials are mapped by Thornburn as "predominantly dark colored moderately permeable from medium to fine textured soils." An old agricultural soils publication on Grundy County also describes organic accumulations within the mass of glacial drift.

In a time sequence between the Minooka formation and Lake Wauponsee, the terminal moraine was also subjected to important quantities of melt water known as the Kankakee torrent. Deposits from the torrent would logically be granular and highly pervious.

We interpret these data as suggesting that overlying the morainal till soils a variety of materials which are likely of finer texture and lower strength will occur with from limited to possibly important but presently undetermined maximum thicknesses. It would not surprise this writer if these thicknesses increased to from 20 to 30 feet. These deposits, where they occur, undoubtedly overlap the basal portion of the Minooka moraine and envelop the irregular configuration of the moraine formed by erosion of that feature during the important interglacial periods which occurred between its deposition and the Lake Wauponsee time. Whereas the morainal materials because of their deposition and character are precompressed and likely relatively high strength. The overlying water-worked deposits will be less strong, generally more pervious with the potential for highly pervious layers or lenticular materials within the sediments. Because the permeability of the morainal materials is small and controlled by joint configurations, surface run-in more than likely moves to the regional drainage features at the interface of the glacial till and the waterlaid materials. It also is likely channeled and controlled by flow in the most pervious materials, if they exist in continuous features leading towards the major drainage pattern.

SITE 10

Preliminary Conclusions

1. The site is underlain partially by glacial moraine and, partially, by a lacustrine and/or outwash over till profile. Areal extent of the water-worked materials is unknown but it will be limited to edges. Their thickness may be thin with local variations.
2. Contact of till-lacustrine units may be sloping; it may also be a contact on which surface in-flow moves to the drainage system.
3. Softer, local accumulations of organic contaminated soils probably occur sporadically at existing grade.

4. Strength of the post-glacial or water-laid materials is likely less, and probably considerably less, than morainal materials.
5. Probable cross-sections through the mass are as shown on attached figures; proposed fills are shown in proper scale.
6. Compacted soil properties will vary in a wide range, as would be indicated by expected variations in material types - sands to medium plastic clays and clay-gravel-boulder mixtures.
7. Local changes in soil water content and perched water tables are likely. Amount of pumping in excavations will vary greatly with

    location,
    depth of contact, and
    season.
8. The mechanisms of soil slope failure considered possible include:
    A. Base failure through lacustrine soils;
    B. Wedge failure on:
        1 - Plane inclined on moraine;
        2 - Soft layer in natural profile;
        3 - Plane built into fill.
9. It is impossible to analyse potential to failure without soil strengths, but the "A" type failure at edges of mass is judged to be likely in some areas. If it occurred it could be of large magnitude.
10. No data on strength of constructed fills other than experience with existing land fills. This evidence does not cover the

range of stresses expected. The data may not be indicative for high range stresses, if envelopes are not linear, and we would expect they are not linear.

11. The over-all stability of the fill mass could be marginal - we actually expect that it will be marginal in some locations. The failure mechanism may be by circular base failure, first, with over-all wedge movement later as the fill reaches maximum proportions.

12. A very complex stress distribution will occur adjacent to a semi-rigid mass placed within the waste fill. The stress distribution will likely change with time as well as applied stress.

13. A 50 foot wide soil wall, for "Spine", is probably not stable if constructed 1000 feet high within the fill. With limited analysis we do not believe a base width of less than 250 feet can be accommodated without risking a failure controlled by geometric considerations rather than by shear strength.

14. Temperature conditions are not definable with present data. Logically we believe construction control will be key to controlling the temperature production. This will require knowledge of heat production at this site with these environmental conditions.

RECOMMENDATIONS

We recommend that:

1. A preliminary study to identify ranges in types of soil materials, areal extent and depth to top of moraine, and depth to groundwater.

2. Work be commenced in edge areas as berm construction will likely be desirable for maximum stability. The extent and limitations of this procedure should be studied.

3. The "Spine" must be located directly on till at all locations. The geometry is such that a 50 foot base width will not be sufficient. Our estimates would suggest 250 feet at base might be required as minimum to eliminate the "geometry problem." Although very complex, the expected stress system makes this a "real" problem. It must be studied now before any construction of "Spine" areas begin. (See Figure).

4. Prior to fixing the design objectives you find and program 50 foot average excavation in order to make a mountain, 1000 feet high, feasible. This criteria assumes 10 percent cover and usable materials (clay type soils) obtainable above free water levels.

5. Monitoring be included as necessary elements in the design procedure. Several features of the construction suggest no reasonable alternatives are available to identifying prototype performance. Items to be measured are:

   A. Relative settlement
   B. Lateral movement
   C. Stresses -
      Vertical
      Horizontal
   D. Gas formation
   E. Temperature
   F. Water movement

6. Construction of the "Ski Mountain" site be considered carefully in a feasibility study to consider magnitudes of problems associated with subsurface foundation conditions. The scope of studies should be defined after preliminary borings provide a correct picture of subsurface conditions.

The opportunity to consider the foundation and soil mechanics aspects of this unique project has been appreciated. We have attempted to communicate the results of our review and analyses without fully describing mechanistic considerations and background. If brevity causes problems we will be happy to meet with you, or your clients, and discuss the areas of concern. Be assured of our continuing interest to serve you as this project advances.

Very truly yours,

WOODWARD-CLYDE & ASSOCIATES

Donald M Duncan

Donald M. Duncan, P. E.

DMD:rg

att.

REFERENCES

1. Piskin, K., and R. E. Bergstrom. Glacial drift in Illinois: thickness and character. Urbana, Illinois State Geological Survey, 1967. 33 p.

2. County of Los Angeles, Department of County Engineer. Development of construction and use criteria for sanitary landfills; an interim report. Cincinnati, U.S. Department of Health, Education, and Welfare, 1969. [267 p.]

3. Smith, R. S., E. E. De Turk, F. C. Bauer, and L. H. Smith. Grundy County soils. University of Illinois Agricultural Experiment Station Soil Report No. 26. Urbana, Mar. 1924. 66 p.

4. Geotechnique, 16(2), June 1966.

5. Laboratory shear testing of soils. ASTM Special Technical Publication No. 361. Philadelphia, American Society of Testing and Materials, 1963. 505 p.

6. Bergstrom, R. E. Disposal of wastes: scientific and administrative considerations. Environmental Geology Notes No. 20. Urbana, Illinois State Geological Survey, Jan. 1968. 12 p.

7. Thornburn, T. H. Surface deposits of Illinois: a guide for soil engineers. University of Illinois Engineering Experiment Station Circular No. 80, Sept. 1963. 135 p.

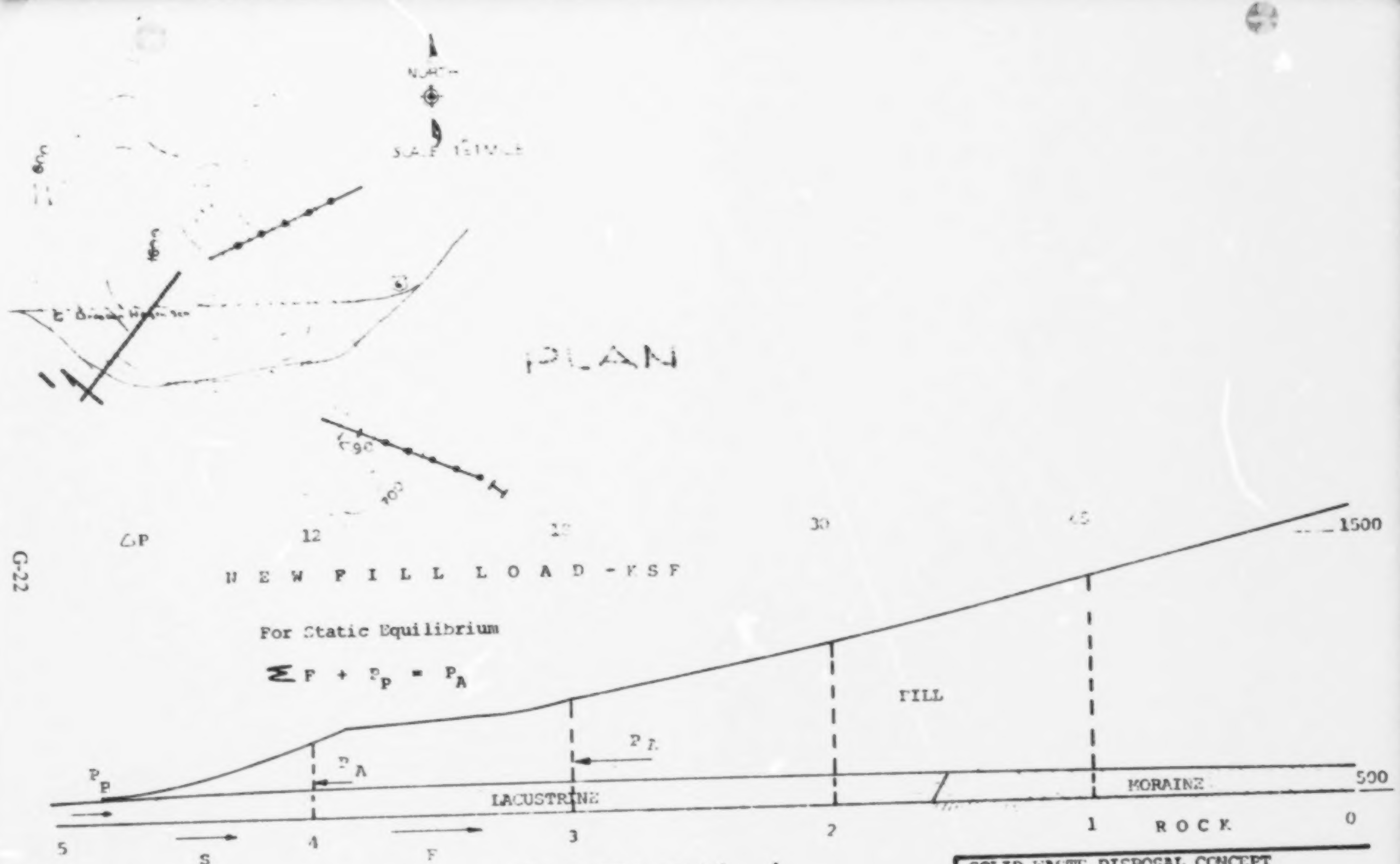
8. Hughes, G. M., P. Kraatz, and R. A. Landon. Bedrock aquifers of Northeastern Illinois. Illinois State Geological Survey Circular 406, 1966. 15 p.

9. Willman, H. B. Geologic map of Illinois. Illinois State Geological Survey, Department of Registration and Education, 1967.

10. Suter, M., R. E. Bergstrom, H. F. Smith, G. H. Emrich, W. C. Walton, and T. E. Larson. Preliminary report on ground-water resources of the Chicago region, Illinois. Illinois Geological Survey and Illinois Water Survey Cooperative Ground-Water Report No. 1. Urbana, 1959. p.17-41.

11. Willman, H. B., and J. N. Payne. Geology and mineral resources of the Marseilles, Ottawa, and Streator Quadrangles. Illinois State Geological Survey Bulletin No. 66, 1942. 388 p.

12. Illinois Technical Advisory Committee on Water Resources. Water for Illinois, a plan for action. State of Illinois, Department of Business and Economic Development, Mar. 1967. p.67-89.


NORTH
PLAN
ΔP
12
18
30
45
1500
NEW FILL LOAD - KSF
For Static Equilibrium
ΣF + P_P = P_A
FILL
P_L
P_A
P_P
MORAINE
LACUSTRINE
500
ROCK
5
4
3
2
1
0
S
F
P

SECTION I

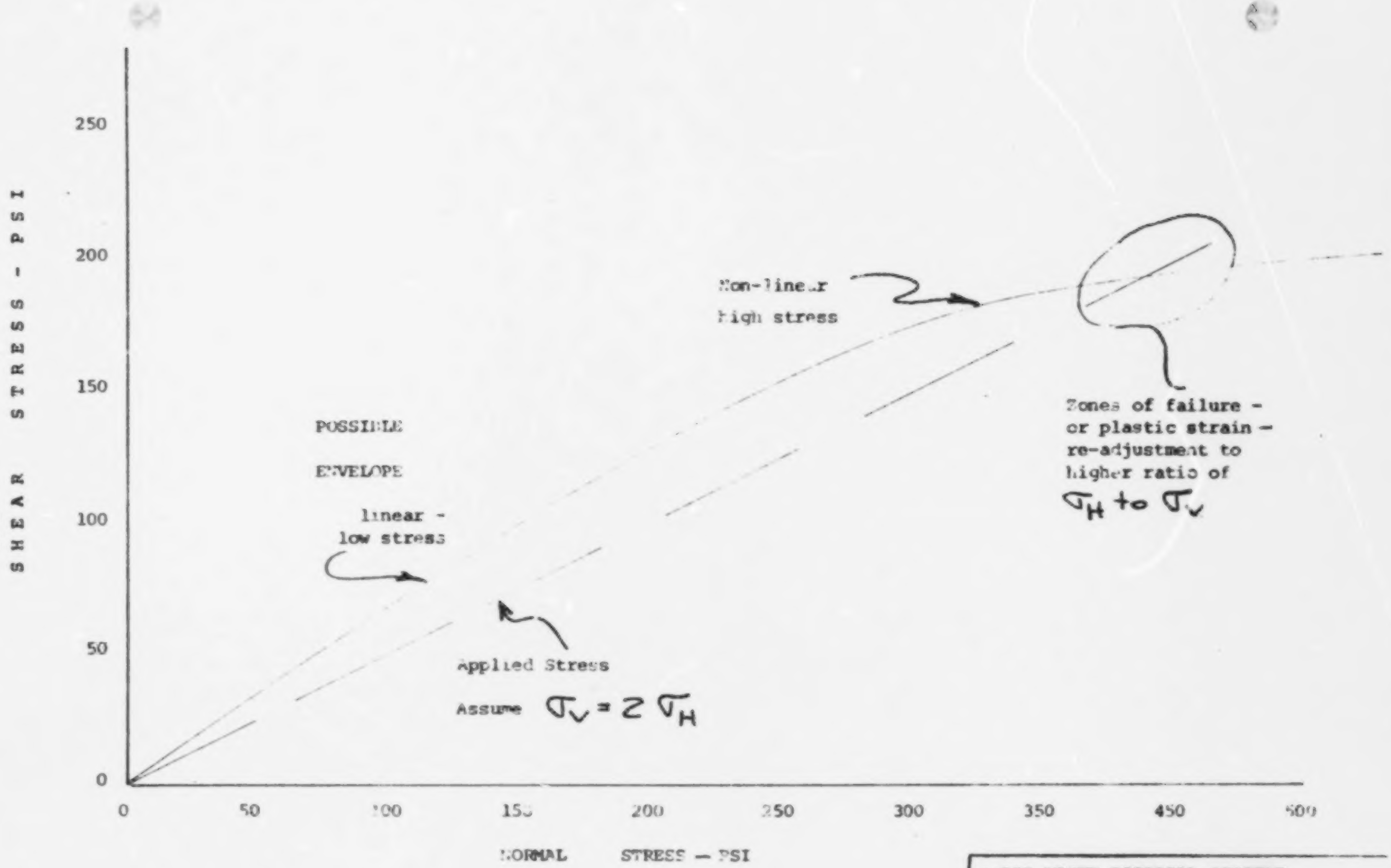
SCALE 1" = 500'

NOTE: Material thicknesses and variations are hypothetical

SOLID WASTE DISPOSAL CONCEPT
COOK COUNTY, ILLINOIS
BLACK & VEATCH

WOODWARD - CLYDE & ASSOCIATES
SOIL AND FOUNDATION ENGINEERS
KANSAS CITY MISSOURI

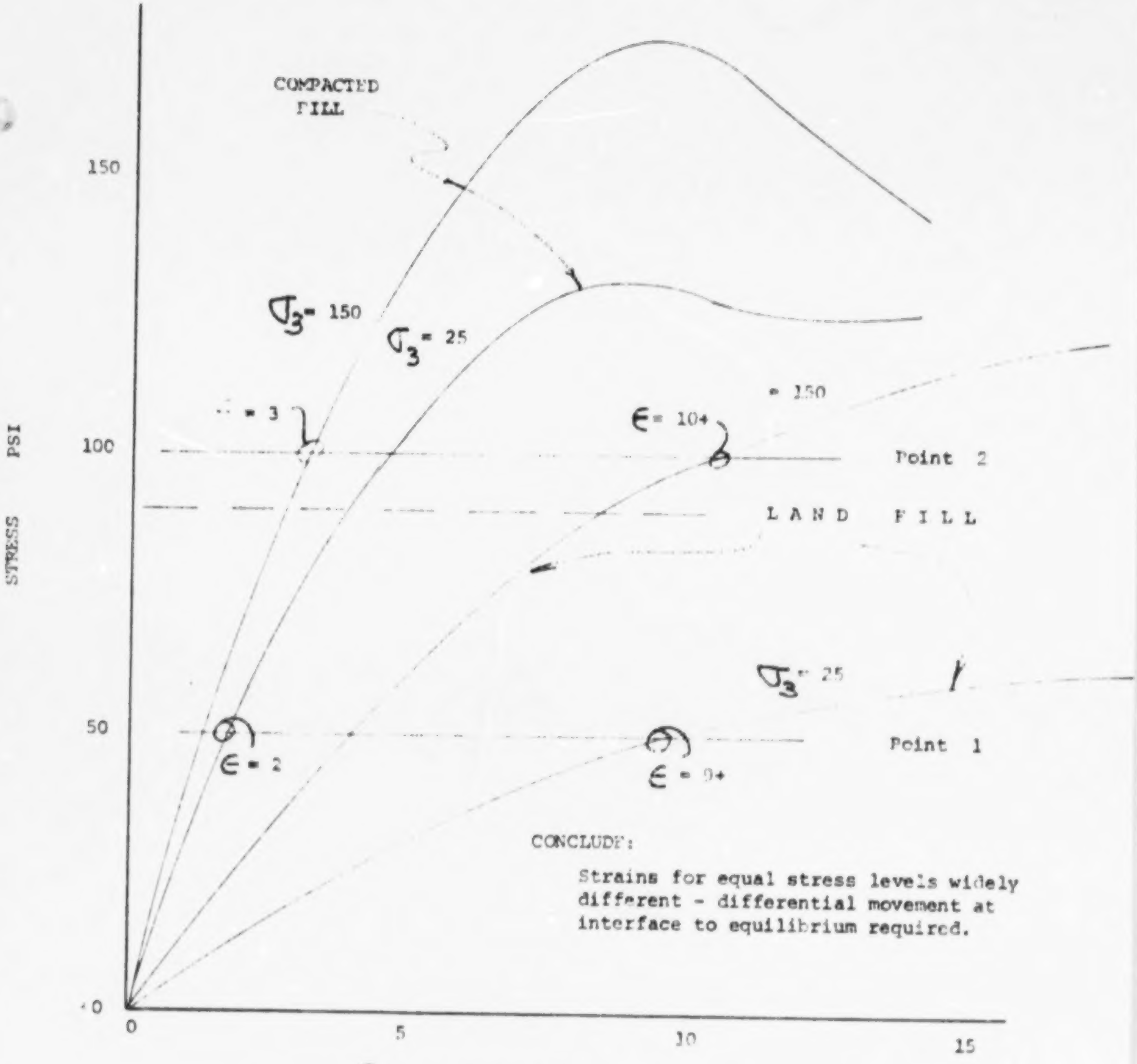
DRAWN BY	DATE	JOB NO. K-70-5
CH KD BY	DATE	
PROPOSED PLAN AND SECTION		FIG NO 1



SOLID WASTE DISPOSAL CONCEPT
COOK COUNTY, ILLINOIS
BLACK & VEATCH

WOODWARD - CLYDE & ASSOCIATES
SOIL AND FOUNDATION ENGINEERS
KANSAS CITY MISSOURI

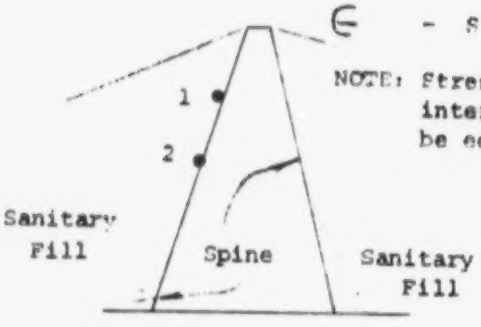
DRAWN BY: DATE JOB NO.
CHKD BY: DATE K-70-5



ε - STRAIN - Per Cent

CONCLUDE:

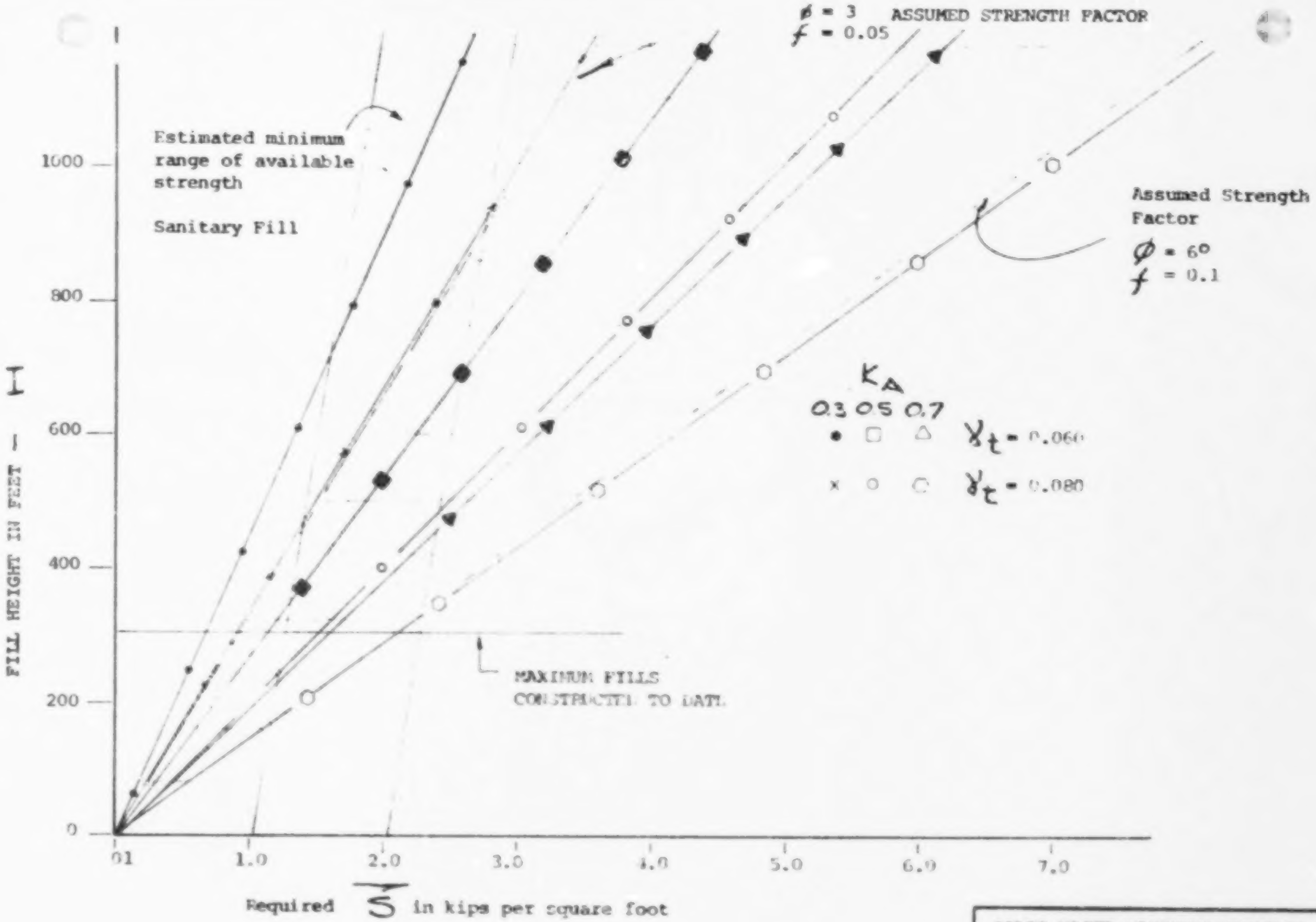
Strains for equal stress levels widely different - differential movement at interface to equilibrium required.



NOTE: Stresses at interface must be equal

SOLID WASTE DISPOSAL CONCEPT
COOK COUNTY, ILLINOIS
BLACK & VEATCH

WOODWARD · CLYDE & ASSOCIATES
SOIL AND FOUNDATION ENGINEERS
KANSAS CITY MISSOURI
DRAWN BY DATE JOB NO
CHKD BY DATE
HYPOTHETICAL STRESS - STRAIN CURVES
FIG. NO 3



SOLID WASTE DISPOSAL CONCEPT
COOK COUNTY, ILLINOIS
BLACK & VEATCH

WOODWARD · CLYDE & ASSOCIATES
SOIL AND FOUNDATION ENGINEERS
KANSAS CITY MISSOURI

DRAWN BY	DATE	JOB NO
CHKD BY	DATE	K-70-5
WEDGE FAILURE STABILITY REQUIREMENTS		FIG NO 4

RECEIVED

JAN 14 1971

BLACK & VEATCH

RICHARD B. OGILVIE
Governor

CLARENCE W. KLASSEN
Director

STATE OF ILLINOIS

ENVIRONMENTAL PROTECTION AGENCY

January 11, 1971

GRUNDY COUNTY - Solid Waste Disposal
Minooka/MSD (Proposed)

Black & Veatch, Inc.
P. O. Box 8405
Kansas City, Missouri 64114

ATTENTION: Mr. F. E. Kirkpatrick

Gentlemen:

This is in reply to your letters of September 25 and October 30, 1970, referring to a thousand foot high solid waste mountain to be located in Grundy and Will Counties.

We have considered the information which you have submitted, and have given considerable thought to the feasibility of such a project with regard to environmental protection. We have also obtained a site survey report from the Illinois State Geological Survey for the area outlined in your correspondence. It is noted that the Survey Report was in considerable disagreement with the information contained in your correspondence regarding the bedrock and ground water conditions in the proposed area.

In view of the foregoing, it is strongly recommended that you arrange for a conference between responsible members of your staff and this Agency with regard to the project prior to the completion of your feasibility report. I will arrange for such a conference and include representatives of the Bureau of Water Pollution Control if you so desire.

Very truly yours,

C.E. Clark

C. E. Clark, Chief
Bureau of Land Pollution Control

In the New Illinois, we accommodate!

2200 CHURCHILL ROAD
AT 2400 WEST JEFFERSON
SPRINGFIELD, ILLINOIS 62706
AREA CODE 217-525-3397

BLACK & VEATCH
CONSULTING ENGINEERS

AREA CODE 816
TEL 361-7000

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS: P. O. BOX NO. 8405
KANSAS CITY, MISSOURI 64114

Metropolitan Sanitary District
of Greater Chicago
Solid Waste Disposal Study
Project 5180

January 20, 1971

Mr. C. E. Clark, Chief
Bureau of Land Pollution Control
Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

Dear Mr. Clark:

Thank you for the opportunity afforded Mr. Weiner and myself to discuss with you, Mr. Palmquist, Mr. Morton and Mr. Busch the study our firm is conducting for the Metropolitan Sanitary District of Greater Chicago. The study is to determine the feasibility of disposing of the solid wastes of Cook County by constructing a mountain that would be used for skiing and other outdoor recreation. This letter will provide a brief record of our discussions in your office on January 18, 1971.

As indicated in previous correspondence to you, the study is being based on a 7000-acre solid waste mountain site in Grundy and Will counties south of Minooka.

You gave us copies of a letter report by the State Geological Survey regarding hydrogeologic conditions of this site, dated August 31, 1970. You also gave us copies of the Environmental Protection Act - 1970 and of other State rules and regulations pertaining to solid wastes.

As discussed, we have revised the filling concept outlined in our letter of September 25, 1970. We now propose to exclude organic waste from the solid waste mountain to the maximum practical extent. This change was made because we see no way of assuring the structural stability of a 1000 foot high fill composed largely of organic matter. The fill would be made with relatively stable materials such as glass, metals, ceramics, incinerator residue, noncombustible demolition debris, broken pavement, concrete, rock from the proposed MSDGC Deep Tunnel project, and wastes of a similar nature.

Organic materials would be disposed of by a combination of other methods, including: recycling, incineration, and returning to agriculture land as compost or as shredded material which would be worked into the soil to compost naturally.

We believe the 50 to 100 feet of glacial till and lake deposits on the proposed solid waste mountain site would protect the bedrock aquifers from pollution by landfill leaching. However, a thorough subsurface investigation should be made prior to final design to further define subsurface conditions, suitability of the site, and provisions which may be required to protect ground water.

Our report will recommend that an underdrain system be provided around the periphery of the solid waste mountain to collect leachate, and that leachate be treated by a modification of the activated sludge process in oxidation ditches. After final settling and chlorination, the effluent would be used to irrigate grass or crops on the site or discharged to the Des Plaines or Illinois river. Surface runoff from the fill site would flow through sedimentation ponds prior to discharge to the rivers.

You advised that:

1. Rules and regulations to be issued soon will require daily covering of incinerator residue, power plant ash, inorganics removed from combined refuse, and any other wastes containing organic matter.

2. Rock, concrete, brick, earth and similar natural inorganic materials will not require daily cover.

3. There is no prohibition on land disposal of organic matter if no pollution results.

4. A special permit is required for placing any sludges in sanitary landfills and the general policy is to exclude sludges if there is a possibility of water pollution.

5. A test hole to bedrock would be required for each 5 acres of a proposed landfill site. Permanent inspection and check wells would be required to monitor leachate. All existing wells on the site would have to be located and plugged.

6. Runoff and treated leachate from the solid waste mountain site should go to the Des Plaines or Illinois rivers and be excluded from the DuPage River and AuxSable Creek. Secondary treatment would be required for leachate discharged to the Des Plaines or Illinois rivers.

7. Your are opposed to the concept of constructing solid waste hills or mountains.

8. At this time, you are opposed to a solid waste mountain at the proposed site near Minooka because of the possibility of water pollution and because you believe the coal strip mines in Illinois are more logical areas for solid waste disposal.

As discussed, we plan to complete the feasibility study for the solid waste mountain based on the site near Minooka and the requirements of the Environmental Protection Agency.

Thank you again for the opportunity to discuss this project, for the information furnished, and for your candor regarding the ski-mountain concept. All of this will assist in evaluating the feasibility of the project.

Very truly yours,

BLACK & VEATCH

F. E. Kirkpatrick

F. E. Kirkpatrick

APPENDIX H

COSTING OF TRANSPORTATION SYSTEMS

Costs of transportation systems for delivering solid wastes to the Ski Mountain were estimated on the following basis:

Level of costs prevailing in 1970

Public ownership, operation and maintenance of:
- Collection vehicles
- Transfer stations
- Processing equipment
- Stationary compaction equipment
- Containers
- Highway transfer vehicles
- Barges
- Railroad equipment
- Pipelines
- Disposal site equipment

Contracts with private firms to own, operate, and maintain tugs for towing barges and trackage for movement of railroad cars, and to operate all railroad equipment

Illinois State size and weight limitations for highway vehicles

Interest rate of 6 per cent for capital

Amortization of publicly owned facilities with equal annual payments of principal and interest over a normal economic life:

Transfer stations	20 years
Processing equipment	20 years
Unloading stations	20 years
Barges	20 years
Railroad equipment	20 years
Mobile cranes	5 years
Trucks (100 ton)	5 years
Transfer tractors	400,000 miles
Transfer trailers	200,000 miles

Annual cost of land as 6 per cent of purchase cost.

APPENDIX H

COSTING OF TRANSPORTATION SYSTEMS

Costs of transportation systems for delivering solid wastes to the Ski Mountain were estimated on the following basis:

Level of costs prevailing in 1970

Public ownership, operation and maintenance of:
- Collection vehicles
- Transfer stations
- Processing equipment
- Stationary compaction equipment
- Containers
- Highway transfer vehicles
- Barges
- Railroad equipment
- Pipelines
- Disposal site equipment

Contracts with private firms to own, operate, and maintain tugs for towing barges and trackage for movement of railroad cars, and to operate all railroad equipment

Illinois State size and weight limitations for highway vehicles

Interest rate of 6 per cent for capital

Amortization of publicly owned facilities with equal annual payments of principal and interest over a normal economic life:

Transfer stations	20 years
Processing equipment	20 years
Unloading stations	20 years
Barges	20 years
Railroad equipment	20 years
Mobile cranes	5 years
Trucks (100 ton)	5 years
Transfer tractors	400,000 miles
Transfer trailers	200,000 miles

Annual cost of land as 6 per cent of purchase cost.

DIRECT HAUL

In Compactor Trucks

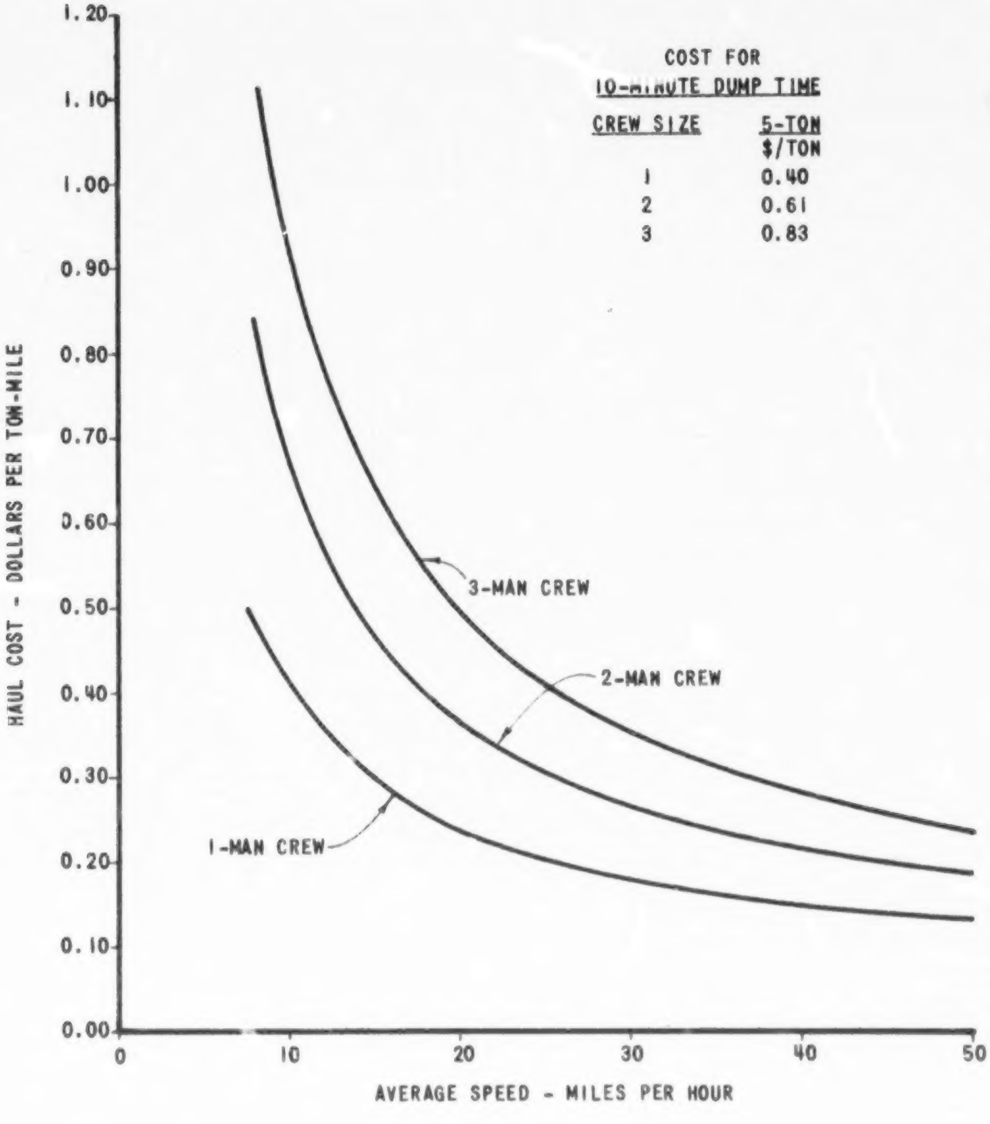
Figures H-1, H-2, and H-3 are curves of the estimated average ton-mile costs for transporting refuse in 20, 25, and 30 cubic yard compactor type refuse collection trucks at average travel speeds ranging from 10 to 50 mph and for 1, 2, and 3 man crews. The curves are for pay loads based on a compacted refuse density of 500 pounds per cubic yard of rated vehicle capacity. Costs for the other pay loads are approximately inversely proportional to pay load.

The curves cover off-route hauling costs and are not applicable to actual collection operations. Estimates were premised on one 8 hour shift, 5 days per week, and include an allowance of one hour of unproductive time per day for startup, refueling, crew breaktime and other lost time.

Major cost factors for the curves are summarized in Table H-1. Hourly fixed costs for vehicles were based on amortizing the initial vehicle cost plus 10 per cent for spares over 5 years for the chassis and 10 years for the packer body. Variable vehicle costs include fuel, oil, grease, tires, servicing and repairs. Labor costs were based on City of Chicago pay scales, plus approximately 26 per cent employee fringe benefits, including holidays, vacation, sick leave, hospitalization insurance, Social Security tax, Workmen's Compensation and pension.

Dumping costs were estimated to be equivalent to the cost of the crew and the truck traveling at 20 mph for 10 minutes.

NOTE: COSTS ARE SHOWN FOR ONE-WAY DISTANCE AND INCLUDE COST OF RETURN TRIP. CURVES ARE BASED ON 5-TON PAY LOAD. COSTS FOR OTHER PAY LOADS ARE APPROXIMATELY INVERSELY PROPORTIONAL TO PAY LOAD.



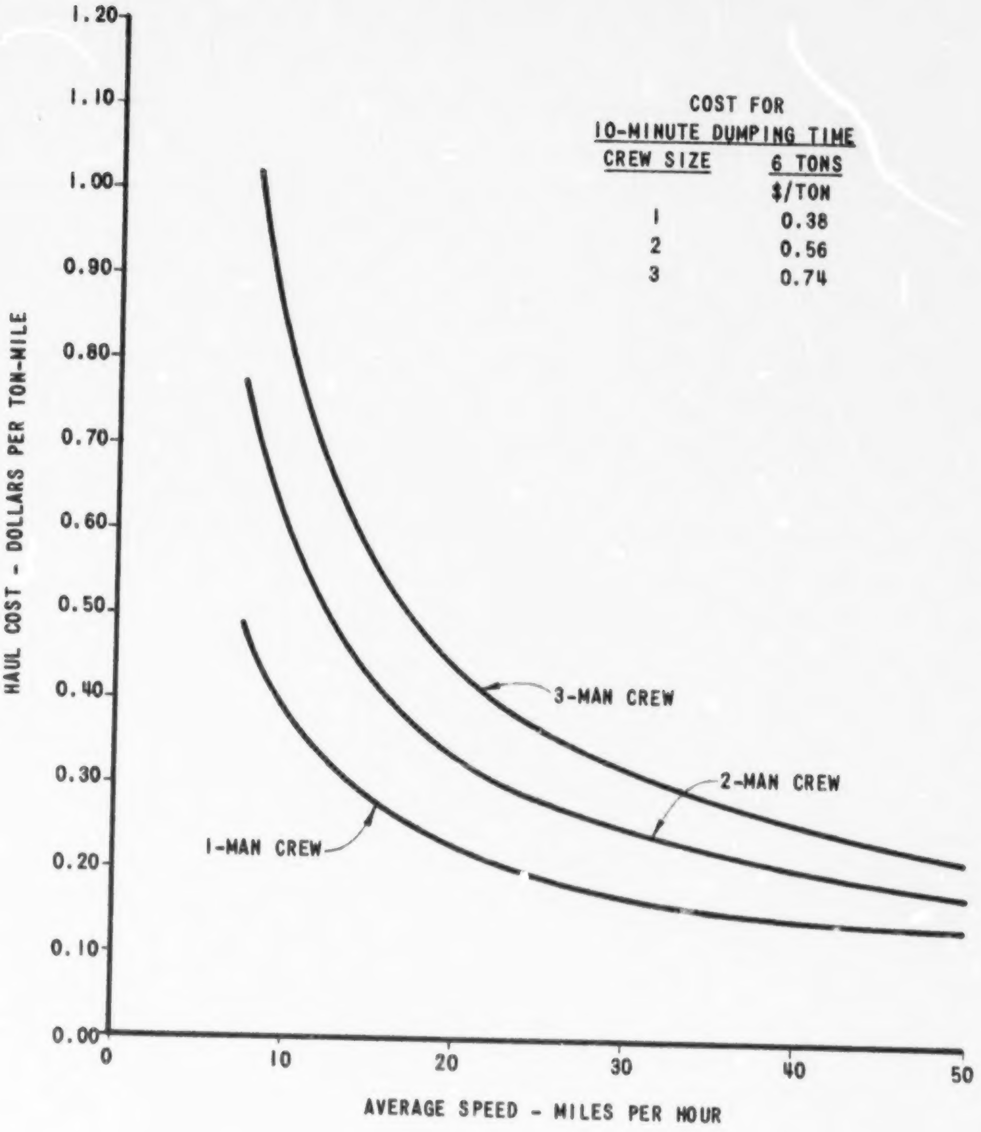
COST FOR 10-MINUTE DUMP TIME

CREW SIZE	5-TON $/TON
1	0.40
2	0.61
3	0.83

ESTIMATED REFUSE HAULING COSTS
20-CUBIC YARD COMPACTOR TRUCKS

FIGURE H-1

NOTE: COSTS ARE SHOWN FOR ONE-WAY DISTANCE AND INCLUDE COST OF RETURN TRIP. CURVES ARE BASED ON 6-TON PAY LOAD. COSTS FOR OTHER PAY LOADS ARE APPROXIMATELY INVERSELY PROPORTIONAL TO PAY LOAD.



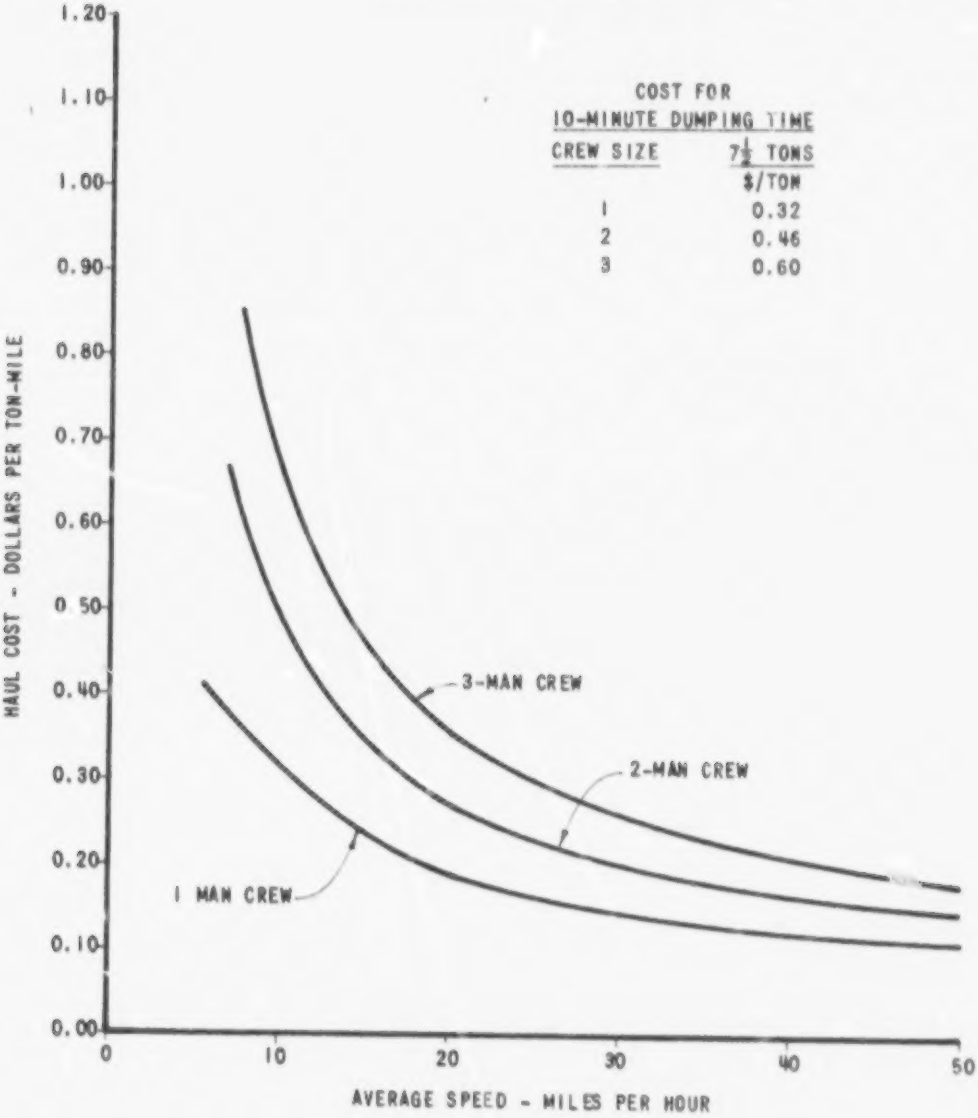
COST FOR
10-MINUTE DUMPING TIME

CREW SIZE	6 TONS $/TON
1	0.38
2	0.56
3	0.74

ESTIMATED REFUSE HAULING COSTS
25-CUBIC YARD COMPACTOR TRUCKS

FIGURE H-2

NOTE: COSTS ARE SHOWN FOR ONE-WAY DISTANCE AND INCLUDE COST FOR RETURN TRIP. CURVES ARE BASED ON 7.5-TON PAY LOAD. COSTS FOR OTHER PAY LOADS ARE APPROXIMATELY INVERSELY PROPORTIONED TO PAY LOAD.



COST FOR 10-MINUTE DUMPING TIME

CREW SIZE	$7\frac{1}{2}$ TONS $/TON
1	0.32
2	0.46
3	0.60

ESTIMATED REFUSE HAULING COSTS
30-CUBIC YARD FRONT LOADING
COMPACTOR TRUCKS

Table H-1

COMPACTOR TYPE TRUCK
ESTIMATED COST FACTORS

Rated Truck Capacity	Truck			Labor	
	Initial Investment	Fixed Cost	Variable Cost	Driver Cost	Laborer Cost
cu yd	$	$/hour	$/mile	$/hour	$/hour
20	20,500	2.05	0.15	6.84	6.44
25	26,000	2.56	0.21	6.84	6.44
30	32,000	3.00	0.22	6.84	6.44

Use of the curves for estimating hauling costs is illustrated by the following example.

Given:

30 cubic yard collection truck
1 man crew
10 miles travel on city streets at 15 mph
30 miles travel on freeway at 40 mph

Find:

Hauling costs for pay load of 7.5 tons and 5.0 tons

Solution:

Cost for 7.5 ton pay load (Figure H-3)

10 miles x $0.24/ton-mile	= $2.40/ton
30 miles x $0.12/ton-mile	= $3.60/ton
Dumping	= $0.32/ton
	$6.32/ton

Cost for 5.0 ton pay load

$6.32/ton x 7.5/5.0 = $9.48/ton

In Self-Dumping Trucks and Semitrailers

Figures H-4 through H-7 are curves of the estimated average unit costs for transporting solid wastes in self-dumping vehicles ranging in capacity from 5 to 60 cubic yards. Except for pay load, the curves were calculated on the same basis as the curves for compactor type trucks using an estimated 5-year life. Major cost factors for the curves are summarized in Table H-2.

Table H-2

SELF-DUMPING TRUCKS AND SEMITRAILERS
ESTIMATED COST FACTORS

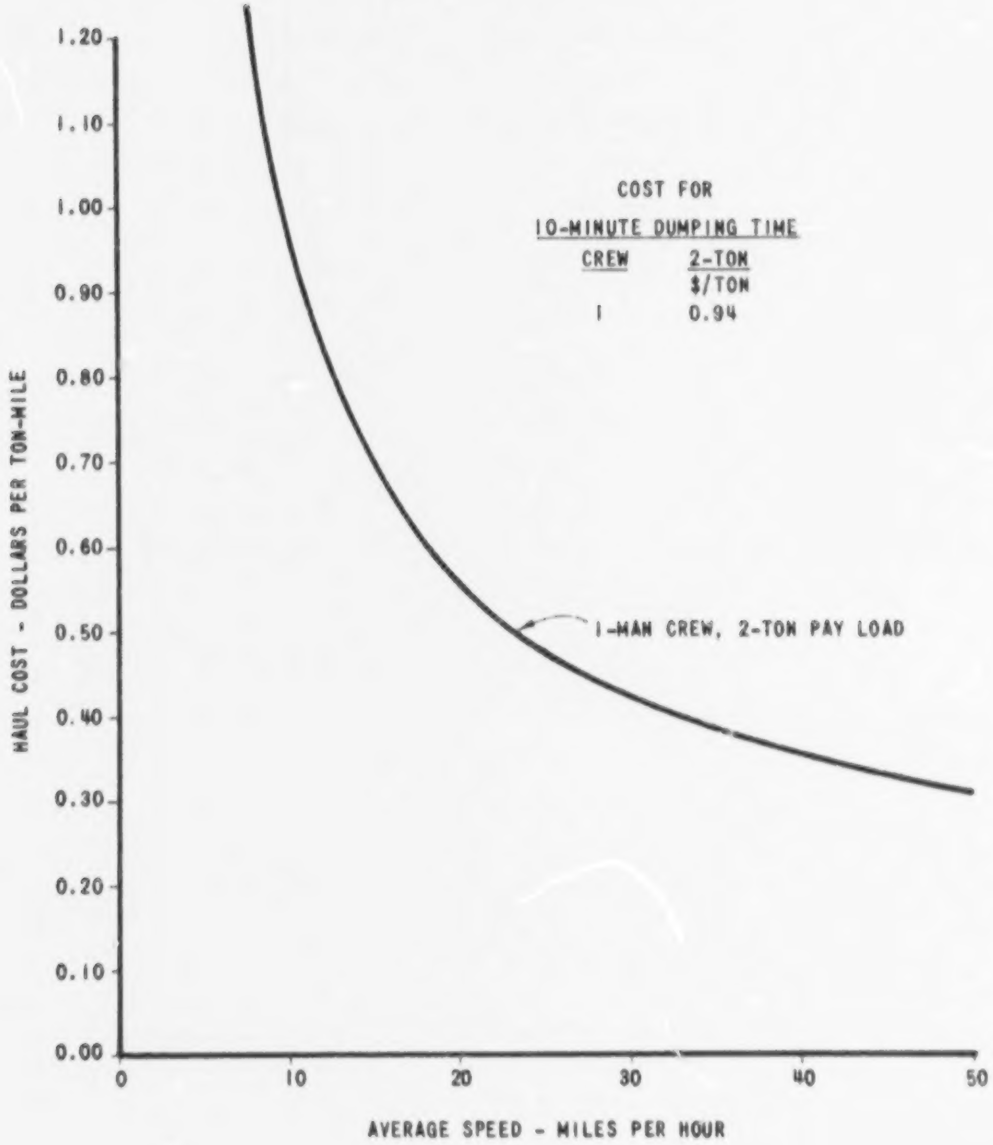
Truck Type and Capacity	Vehicle Initial Investment	 Fixed Cost	 Variable Cost	Driver Cost
	$	$/hour	$/mile	$/hour
Two axle truck				
5 cubic yards	13,500	1.61	0.14	6.84
18 cubic yards	15,800	1.89	0.14	6.84
Three axle truck				
10 cubic yards	19,300	2.28	0.22	6.84
Tractor-semitrailer				
33 cubic yards	30,500	3.61	0.22	6.84
60 cubic yards	35,000	4.16	0.22	6.84

Figure H-8 shows a basis for estimating the cost of hauling incinerator residue in 10-cubic yard dump trucks and 33-cubic yard self-dumping semitrailers. Quenched residue weighs about 1,000 pounds per cubic yard. Figure H-8 is based on a 3-shift per day hauling operation.

Use of the curves on Figure H-8 to estimate the per ton cost of hauling incinerator residue to specific disposal sites is as follows:

1. From a map, determine the approximate distance in miles of travel at various speeds for a tractor and semitrailer between the incinerator plant and disposal site. Also determine total one-way miles.
2. From data in (1), estimate one-way travel time between incinerator plant and disposal site.

NOTE: COSTS ARE SHOWN FOR ONE-WAY DISTANCE AND INCLUDE COST OF RETURN TRIP. CURVES ARE BASED ON 2-TON PAY LOAD. COST FOR OTHER PAY LOADS ARE APPROXIMATELY INVERSELY PROPORTIONAL TO PAY LOAD.



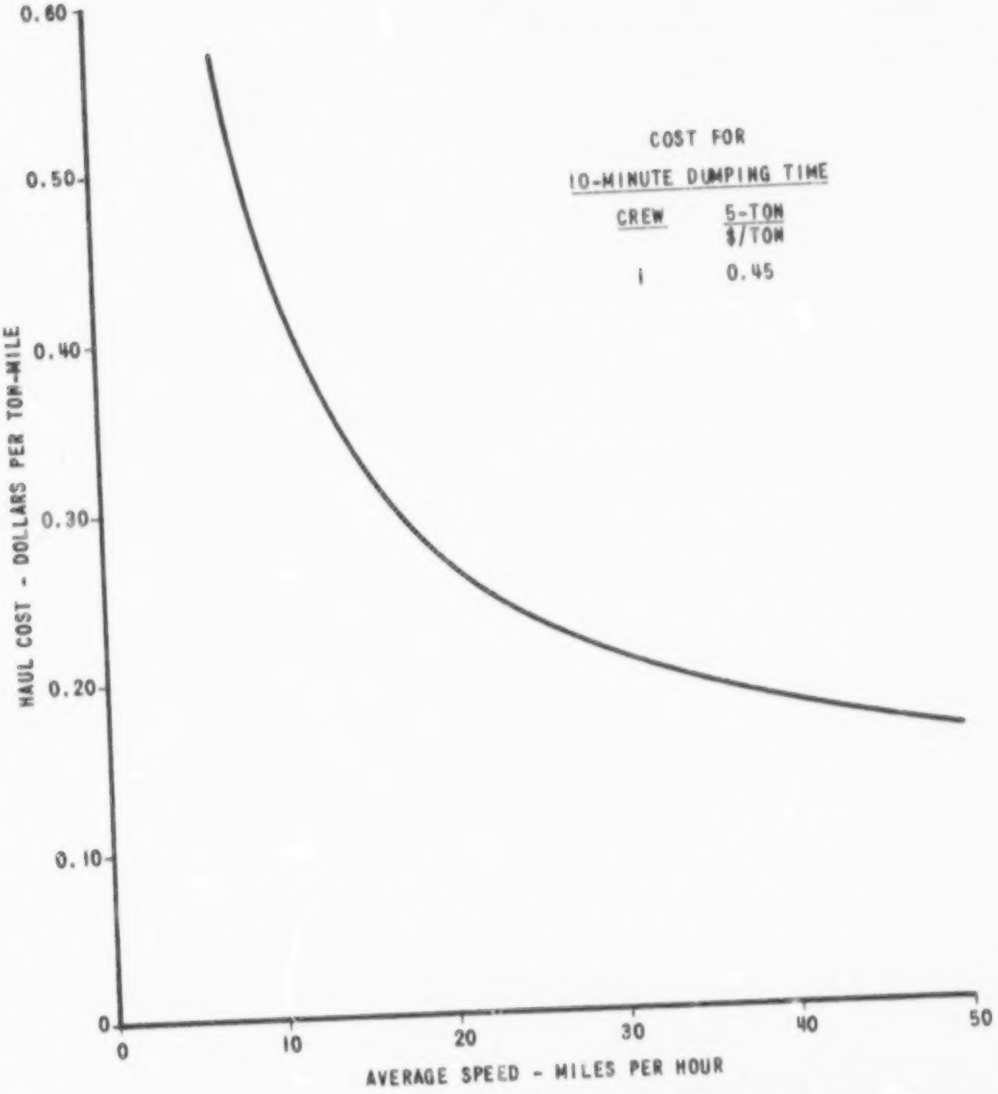
COST FOR
10-MINUTE DUMPING TIME

CREW	2-TON $/TON
1	0.94

ESTIMATED REFUSE HAULING COSTS
5 CUBIC YARD DUMP TRUCK

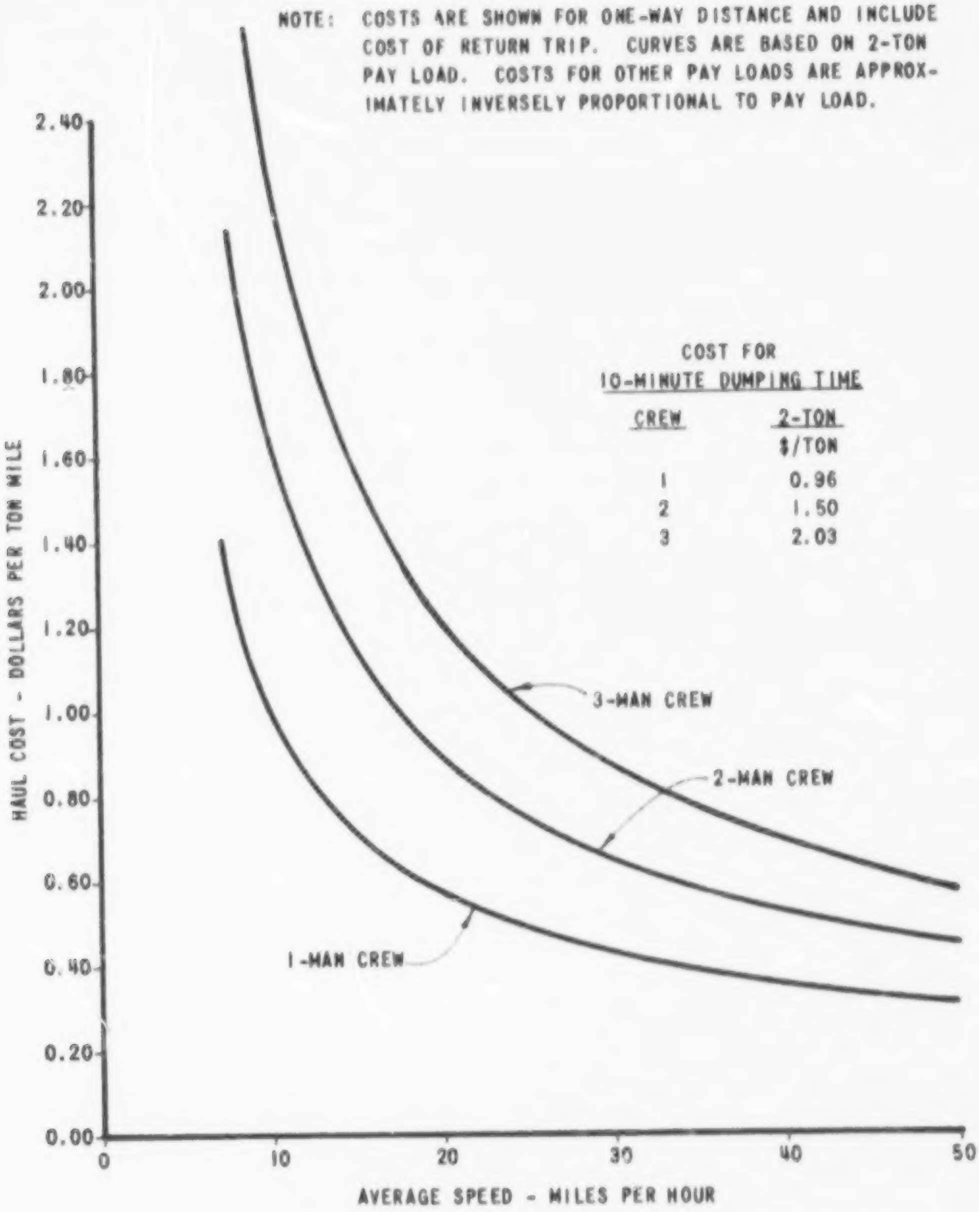
FIGURE H-4

NOTE: COSTS ARE SHOWN FOR ONE-WAY DISTANCE AND INCLUDE COST OF RETURN TRIP. CURVES ARE BASED ON 5-TON PAY LOAD. COSTS FOR OTHER PAY LOADS ARE APPROXIMATELY INVERSELY PROPORTIONAL TO PAY LOAD.



ESTIMATED REFUSE HAULING COSTS
10-CUBIC YARD OPEN DUMP TRUCKS

FIGURE H-5

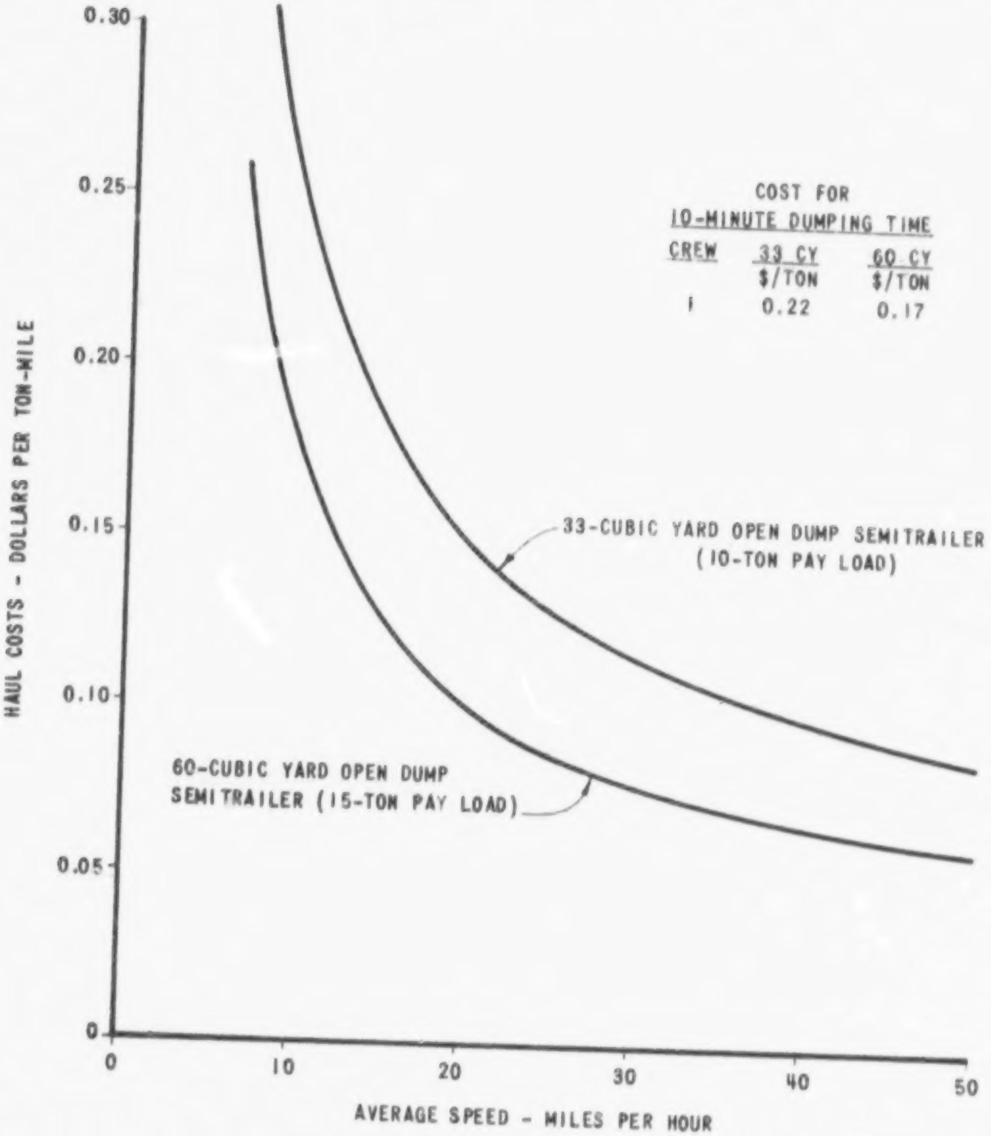
 NOTE: COSTS ARE SHOWN FOR ONE-WAY DISTANCE AND INCLUDE COST OF RETURN TRIP. CURVES ARE BASED ON 2-TON PAY LOAD. COSTS FOR OTHER PAY LOADS ARE APPROXIMATELY INVERSELY PROPORTIONAL TO PAY LOAD.

COST FOR 10-MINUTE DUMPING TIME

CREW	2-TON $/TON
1	0.96
2	1.50
3	2.03

ESTIMATED REFUSE HAULING COSTS
18-CUBIC YARD DUMP TRUCKS

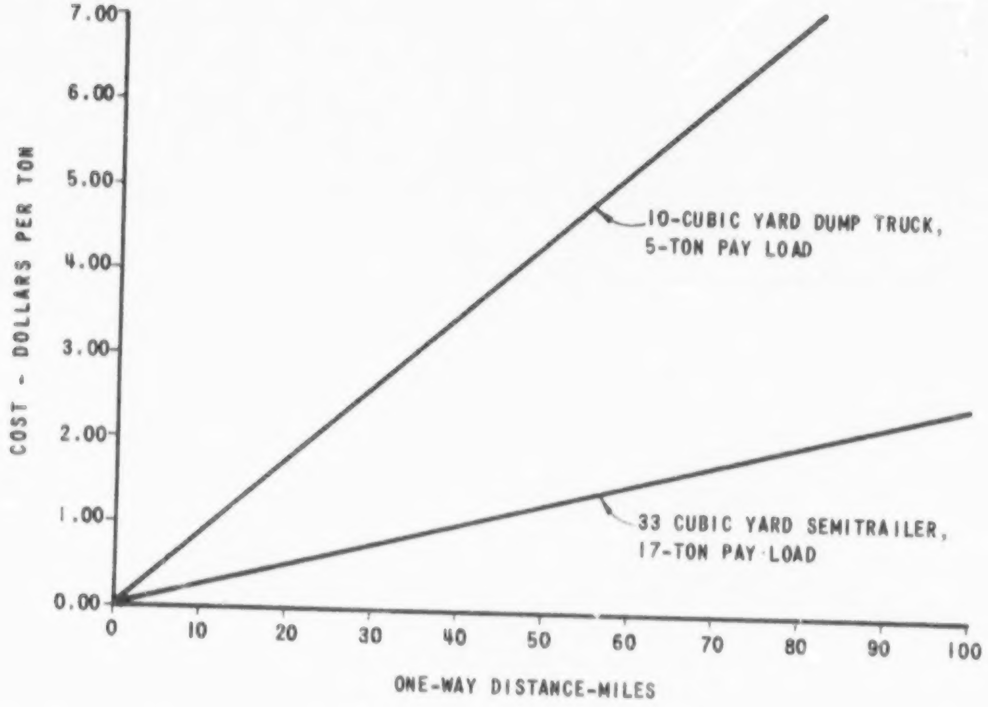
NOTE: COSTS ARE SHOWN FOR ONE-WAY DISTANCE AND INCLUDE COST FOR RETURN TRIP. CURVES ARE BASED ON PAY LOADS INDICATED. COSTS FOR OTHER PAY LOADS ARE APPROXIMATELY INVERSELY PROPORTIONAL TO PAY LOAD.



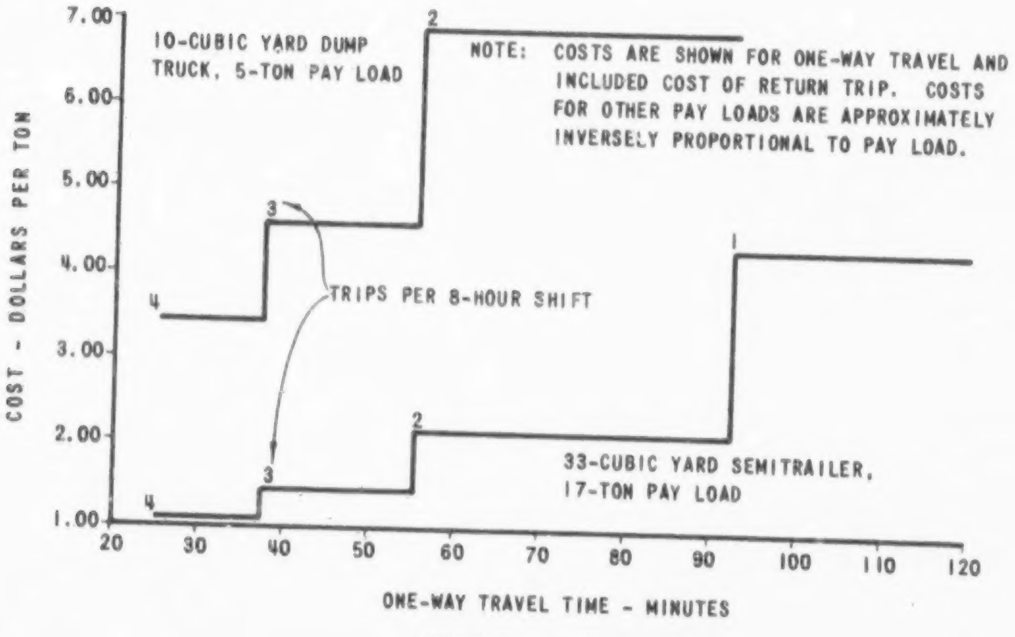
COST FOR 10-MINUTE DUMPING TIME

CREW	33 CY $/TON	60 CY $/TON
1	0.22	0.17

ESTIMATED REFUSE HAULING COSTS
33 - AND 60 - CUBIC YARD SEMITRAILERS



CURVE A - VARIABLE COSTS



CURVE B - FIXED COSTS

TRUCK HAULING COSTS
FOR INCINERATOR RESIDUE

FIGURE H-8

3. With this one-way travel time, determine from Curve B the number of round trips a tractor can make per 8-hour shift. Project the "trips/shift" line horizontally to the left margin and read the fixed cost of hauling.
4. Determine the variable hauling cost from Curve A for the total one-way miles.
5. Add the per ton costs determined from (3) and (4).

TRANSFER VIA HIGHWAY SEMITRAILER

Unprocessed Refuse

Table H-3 shows the estimated initial cost and annual cost of a transfer station designed to handle 1,000 tons per day of unprocessed residential, commercial, and industrial refuse.

Per ton costs for the elements of transfer are shown by the curves on Figure H-9. Curve A shows estimated variable costs consisting principally of fuel, oil, tires, servicing, and repairs. Curve B shows estimated fixed costs of hauling consisting principally of driver costs, insurance, and amortization of investment in tractors and semitrailers. Curve C shows the estimated cost for owning and operating the transfer station. Hauling costs were estimated on the following premises:

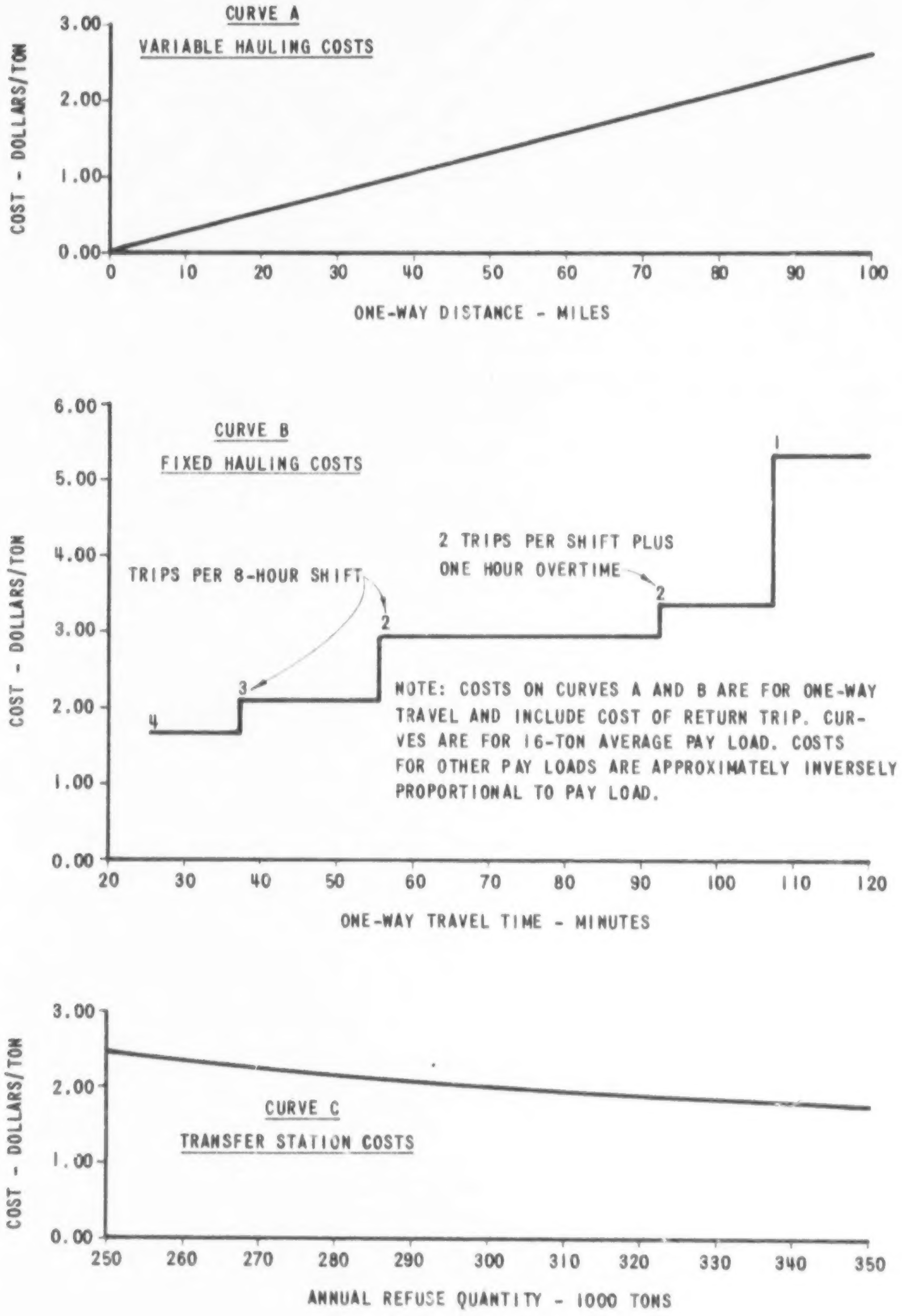
1. Hauling three 8-hour shifts per day.
2. Capacity to handle peak daily quantities 130 per cent of design average daily quantities.
3. Average trailer pay load of 16 tons.
4. Transportation equipment to handle peak load of 1,300 tons per day:

	Trips per 8-Hour Shift	
	One	Two
Tractors	27	14
Trailers	73	59

5. Initial cost of $21,000 for each tractor and $13,000 for each trailer.
6. Amortization of tractors in 400,000 miles and trailers in 200,000 miles.
7. Driver cost of $12,300 per year including employee fringe benefits but excluding overtime.

Use of the curves to estimate the per ton cost of transferring and hauling to specific disposal sites is as follows:

1. From a map, determine the approximate distance in miles of travel at various speeds for a tractor and semitrailer between



NOTE: COSTS ON CURVES A AND B ARE FOR ONE-WAY TRAVEL AND INCLUDE COST OF RETURN TRIP. CURVES ARE FOR 16-TON AVERAGE PAY LOAD. COSTS FOR OTHER PAY LOADS ARE APPROXIMATELY INVERSELY PROPORTIONAL TO PAY LOAD.

ESTIMATED TRANSFER HAUL COSTS
NONCOMPACTING TRAILERS

FIGURE H-9

Table H-3

TRANSFER STATION COSTS FOR HAUL VIA SEMITRAILER

(1,000 Tons/Day Capacity)

		Estimated Costs	
		Initial Cost $	Annual Cost $
Capital Costs			
Land (allowance)		750,000	45,000
Building and site development		2,000,000	175,000
Station mobile equipment		200,000	30,000
Subtotal – Capital Costs		2,950,000	250,000
Operating Expense			
Labor			
Superintendent (1)	20,000		
Shift foreman (3)	50,700		
Equipment operator (3)	51,300		
Truck driver (3)	36,900		
Laborer (4)	11,600		
Scaleman (4)	34,800		
Subtotal - 5 days	240,100		
Add for 6th day	36,900		
			277,000
Utilities			10,000
Station maintenance			8,000
Equipment operation and maintenance			30,000
Materials and supplies			5,000
Trailer unloading			30,000
Subtotal - Operating Expense			360,000
Total Annual Cost			$610,000

the transfer station and disposal site. Also determine total one-way miles.

2. From data in (1), estimate one-way travel time between transfer station and disposal site.
3. With this one-way travel time, determine from Curve B the number of round trips a tractor can make per 8-hour shift. Project the "trips/shift" line horizontally to the left margin and read the fixed cost of hauling.
4. Determine the variable hauling cost from Curve A for the total one-way miles.
5. With the annual tonnage to be transferred per 1,000 tons per day of station capacity, determine from Curve C the transfer station cost.
6. Add the per ton costs determined from (3), (4), and (5).

For example, assuming transfer of 300,000 tons annually from a 1,000 ton per day station and one-way travel of 10 miles at 15 mph and 30 miles at 40 mph, the cost of transfer is estimated as follows:

One-way travel:	
10 miles x 4 minutes/mile =	40 minutes
30 miles x 1.5 minutes/mile =	45 minutes
40 miles	85 minutes
Round trips per shift (Curve B) =	2
Hauling fixed cost (Curve B) =	$2.95/ton
Hauling variable cost (Curve A) =	$1.05/ton
Transfer station cost (Curve C) =	$1.90/ton
Total	$5.90/ton

Baled Refuse

Table H-4 shows the estimated initial cost and annual cost of a 1,000 ton per day transfer and baling station handling residential, commercial, and industrial refuse.

The curves on Figure H-10 show the elements of cost for baling and transfer of baled refuse by semitrailer. Hauling costs on the curves are premised on the following:

1. Hauling three 8-hour shifts per day.
2. Capacity to handle peak daily quantities 130 per cent of design average daily quantities.
3. Average pay load of 25 tons due to low weight of trailer.
4. Transportation equipment to handle load of 1,300 tons per day·

	Trips per 8-Hour Shift	
	One	Two
Tractors	18	9
Trailers	20	10

5. Initial cost of $21,000 per tractor and $5,000 per trailer.
6. Amortization of tractors in 400,000 miles and trailers in 200,000 miles.
7. Driver cost of $12,300 per year including employee fringe benefits but excluding overtime.

Use of the curves for estimating transfer and hauling cost is the same as explained previously for transfer of unprocessed refuse in van type semitrailers. For example, assuming transfer of 300,000 tons annually from a 1,000 ton per day station and one-way travel of 10 miles at 15 mph and 30 miles at 40 mph, the cost is estimated as follows:

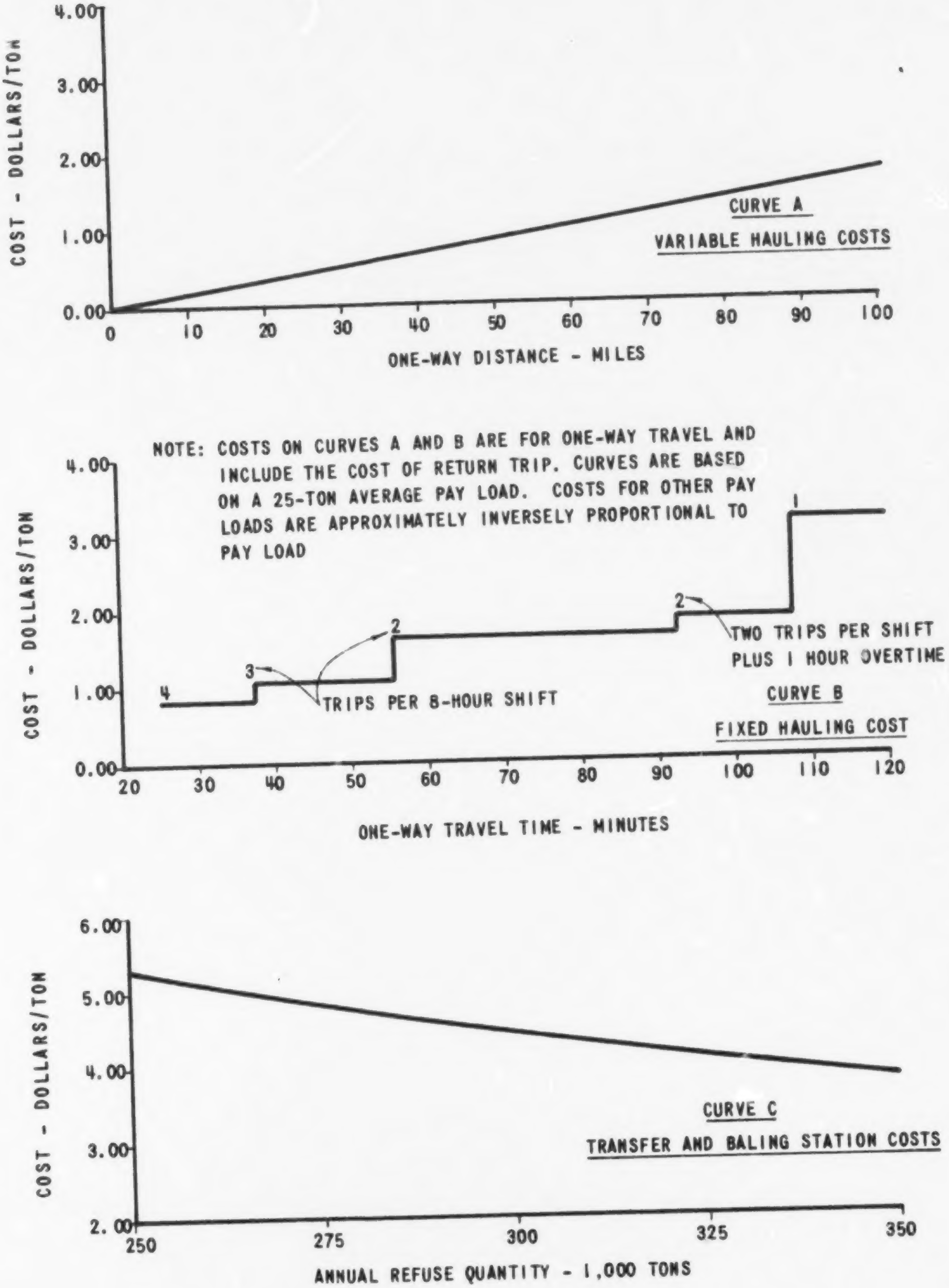
One-way travel:

10 miles x 4 minutes/mile =	40 minutes
30 miles x 1.5 minutes/mile =	45 minutes
40 miles	85 minutes
Round trips per shift (Curve B) =	2
Hauling fixed cost (Curve B) =	$1.60/ton
Hauling variable cost (Curve A) =	$0.65/ton
Transfer station cost (Curve C) =	$4.40/ton
Total	$6.65/ton

Table H-4

TRANSFER AND BALING STATION COSTS
FOR HAUL VIA SEMITRAILERS
(1,000 Tons/Day Capacity)

		Estimated Costs	
		Initial Cost	Annual Cost
		$	$
Capital Costs			
Land (allowance)		750,000	45,000
Transfer and baling station		4,800,000	418,600
Station mobile equipment		50,000	6,800
Subtotal - Capital Costs		5,600,000	470,400
Operating Expense			
Labor			
Superintendent (1)	20,000		
Shift foreman (2)	33,800		
Equipment operators (10)	171,000		
Electrician (1)	18,700		
Maintenance mechanic (2)	35,600		
Truck driver (2)	24,600		
Laborer (10)	116,000		
Scaleman (2)	17,400		
Subtotal - 5 days	437,100		
Add for 6th day	102,400		
			539,500
Utilities			170,000
Maintenance			103,500
Materials and supplies			16,600
Trailer unloading			25,000
Subtotal - Operating Expense			854,600
Total Annual Cost			$1,325,000



NOTE: COSTS ON CURVES A AND B ARE FOR ONE-WAY TRAVEL AND INCLUDE THE COST OF RETURN TRIP. CURVES ARE BASED ON A 25-TON AVERAGE PAY LOAD. COSTS FOR OTHER PAY LOADS ARE APPROXIMATELY INVERSELY PROPORTIONAL TO PAY LOAD

ESTIMATED BALING AND TRANSFER
HAUL COST ON FLATBED TRAILERS

FIGURE H-10

Shredded and Separated Refuse

Table H-5 shows the estimated initial cost and annual cost for a 1,000 ton per day transfer station designed to receive and shred residential, commercial, and industrial refuse and to separate the shredded material into organic and inorganic fractions.

The curves on Figure H-11 show the elements of costs for shredding, separating and transfer of separated refuse by semitrailer. Separate haul cost curves are shown for organic and inorganic materials because the latter are more dense and will permit larger pay loads. Hauling costs on the curves are premised on the following:

1. Hauling three 8-hour shifts per day.
2. Capacity to handle peak daily quantities 130 per cent of design average daily quantities.
3. Average pay load of 16 tons for organics and 20 tons for inorganics.
4. Transportation equipment to handle 1,300 tons per day:

	Trips per 8-Hour Shift	
	One	Two
Tractors	28	14
Trailers	28	17

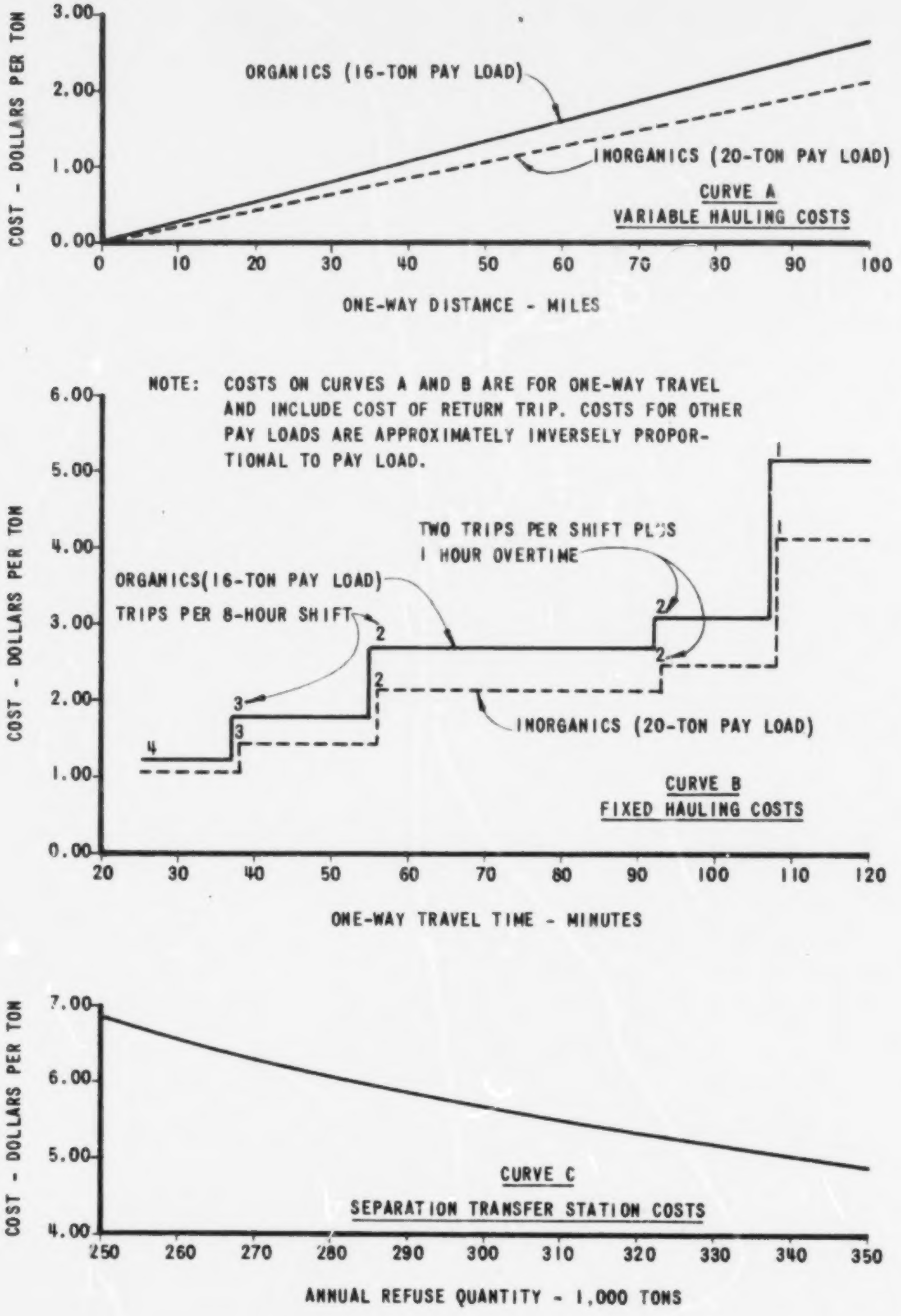
5. Initial cost of $21,000 for tractors and $13,000 for trailers.
6. Amortization of tractors in 400,000 miles and trailers in 200,000 miles.
7. Driver cost of $12,300 per year including employee fringe benefits but excluding overtime.

Table H-5

TRANSFER AND SEPARATION STATION COSTS FOR HAUL VIA SEMITRAILER

(1,000 Tons/Day Capacity)

		Estimated Costs	
		Initial Cost	Annual Cost
		$	$
Capital Costs			
Land (allowance)		750,000	45,000
Building and site development		3,350,000	292,100
Station equipment			
Shredding		1,300,000	113,400
Separation		1,000,000	87,200
Mobile		50,000	6,800
Subtotal - Capital Cost		6,450,000	544,500
Operating Expense			
Labor			
Superintendent (1)	20,000		
Foreman (3)	50,700		
Equipment operators (12)	205,200		
Scaleman (4)	34,800		
Clerk (1)	6,500		
Laborer (23)	266,800		
Truck driver (3)	36,900		
Maintenance mechanic (3)	53,400		
Electrician (1)	18,700		
Subtotal - 5 days (51)	693,000		
Add for 6th day	114,400		
			807,400
Utilities			180,000
Station maintenance			16,800
Equipment maintenance			136,300
Materials and supplies			5,000
Unloading			25,000
Subtotal - Operating Expense			1,170,500
Total Annual Cost			$1,715,000



ESTIMATED SEPARATION AND TRANSFER
HAUL COSTS IN NONCOMPACTING TRAILERS

FIGURE H-11

TRANSFER VIA BARGE

Rock

Table H-6 shows the estimated initial capital investment exclusive of tugs, annual capital and operating costs, and average unit costs for barge transportation of deep tunnel rock to the proposed Ski Mountain site. The analysis was premised on all rock being sized to a maximum of 8 inches and loaded on the barges by others. The estimates were based on transporting 20,000,000 tons of rock per year from three barge loading stations located near the three principal storm water storage facilities proposed for the Deep Tunnel system. Costs include transferring Northside rock from small barges to standard barges, unloading all rock from barges and hauling in 100-ton trucks to the final disposal area.

The cost of transporting ash by barge from power plants in Cook County to the Ski Mountain was estimated on the basis of providing 5 loading docks, one unloading dock, 10 barges, one crane, and one 100-ton truck for hauling from the unloading dock to the fill area. The cost of loading ash on barges would be borne by the customer and was not included in the estimate. Table H-7 shows the estimated initial capital investment exclusive of tugs, the annual capital and operating costs, and the average unit cost for barge transportation of 500,000 tons of ash annually.

Incinerator Residue

The cost of transporting incinerator residue by barge from incinerator plants in Cook County to the Ski Mountain was estimated on the basis of providing 3 barge loading docks, one unloading dock, 8 barges, one crane, and one 100-ton truck for hauling from the unloading dock to the fill area. The cost of delivering residue from incinerator plants to barge docks was not included.

Table H-6

ESTIMATED COSTS FOR BARGE TRANSPORTATION OF DEEP TUNNEL ROCK

	Receiving and Barge Loading Stations				
	Northside	Southwest	Calumet	Disposal Site	Total
Property Required					
Station - tons per year	4,000,000	14,000,000	2,000,000	20,000,000	20,000,000
Barges					
Small	14	–	–	–	14
Standard	36	108	17	–	161
Unloading equipment					
Cranes	6	–	–	7	13
Trucks	–	–	–	25	25
Capital Required	$	$	$	$	$
Land	750,000	750,000	750,000	–	2,250,000
Station	2,240,000	3,490,000	1,620,000	2,270,000	9,620,000
Barges	3,940,000	9,720,000	1,530,000	–	15,190,000
Unloading equipment	570,000	–	–	5,570,000	6,140,000
Total	7,500,000	13,960,000	3,900,000	7,840,000	33,200,000
Annual Cost					
Receiving loading					
Interest on land	45,000	45,000	45,000	–	135,000
Amortization of facilities	195,000	304,000	141,000	–	640,000
Labor	318,000	1,028,000	178,000	–	1,524,000
Maintenance and supplies	12,000	19,000	9,000	–	40,000
Utilities	10,000	10,000	10,000	–	30,000
Subtotal	580,000	1,406,000	383,000	–	2,369,000
Transportation					
Amortization of barges	344,000	848,000	133,000	–	1,325,000
Maintenance	185,000	400,000	63,000	–	648,000
Contract towing	3,898,000	5,192,000	872,000	–	9,962,000
Subtotal	4,427,000	6,440,000	1,068,000	–	11,935,000
Unloading, placing in landfill					
Amortization of facilities	–	–	–	197,000	197,000
Amortization of equipment	–	–	–	1,322,000	1,322,000
Labor	–	–	–	2,329,000	2,329,000
Maintenance and supplies	–	–	–	719,000	719,000
Utilities	–	–	–	10,000	10,000
Fleeting tug	–	–	–	219,000	219,000
Subtotal	–	–	–	4,796,000	4,796,000
Total Annual Cost	5,007,000	7,846,000	1,451,000	4,796,000	19,100,000
Cost Per Ton					
Receiving	0.15	0.10	0.19	–	0.12
Transportation	1.11	0.46	0.53	–	0.60
Unloading, placing in landfill	0.24	0.24	0.24	0.24	0.24
Total	1.50	0.80	0.96	0.24	0.96

Table H-7

ESTIMATED COSTS FOR BARGE TRANSPORTATION OF POWER PLANT ASH

(500,000 Tons per Year)

	Estimated Costs	
	Initial Cost	Annual Cost
	$	$
Capital Costs		
Loading docks (5)	5,100,000	444,200
Unloading dock (1)	665,000	58,500
Barges (10)	900,000	78,500
Unloading equipment	295,000	70,000
Subtotal - Capital Cost	5,960,000	651,200
Operating Expense		
Labor for unloading		29,400
Dock maintenance		28,800
Equipment maintenance		51,800
Equipment operating		16,000
Towing (contract)		222,000
Subtotal - Operating Expense		348,000
Total Annual Cost		$999,200
Average Cost per Ton		2.00

Table H-8 shows the estimated initial capital investment exclusive of tugs, the annual capital and operating costs, and the average unit cost for barge transportation of approximately 440,000 tons of incinerator residue annually.

Table H-8

ESTIMATED COSTS FOR BARGE TRANSPORTATION OF INCINERATOR PLANT RESIDUE

(440,000 Tons per Year)

	Estimated Costs	
	Initial Cost	Annual Cost
	$	$
Capital Cost		
Loading docks (3)	3,060,000	266,800
Land for docks (3)	1,125,000	67,500
Unloading docks (1)	665,000	58,000
Barges (8)	640,000	55,800
Unloading equipment	295,000	70,000
Subtotal - Capital Cost	5,785,000	518,100
Operating Expense		
Labor for loading and unloading barges		193,900
Dock maintenance		18,600
Equipment maintenance		45,400
Equipment operation		16,000
Towing (contract)		209,000
Subtotal - Operating Expense		482,900
Total Annual Cost		$1,001,000
Average Cost per Ton		2.28

Baled Refuse

Table H-9 shows the estimated initial capital investment exclusive of tugs, annual capital and operating costs, and average per ton cost for barge transportation of baled refuse to the proposed Ski Mountain including baling, loading on barges, unloading from barges, and hauling to the final disposal area. The estimates are based on the projected 1975 quantity of residential, commercial, and industrial refuse which might be delivered economically to barge transfer stations.

Containerized Refuse

Table H-10 shows the estimated initial capital investment, annual capital and operating costs, and average per ton cost for barge transportation of containerized refuse to the proposed Ski Mountain including unloading from barges and hauling to the final disposal area. The estimates are based on the projected 1975 quantity of residential, commercial, and industrial refuse which might be delivered economically to barge transfer stations.

Table H-9

ESTIMATED COSTS FOR BARGE TRANSPORTATION OF BALED REFUSE

	Receiving, Baling and Loading Stations						
	North Shore	Medill	Central	Summit	Cal-Sag	Disposal Site	Total
Estimated Annual Quantity - tons	936,000	936,000	1,560,000	624,000	1,248,000	5,304,000	5,304,000
Property Required							
Station - tons/day avg	3,000	3,000	5,000	2,000	4,000	17,000	17,000
Barges	18	14	23	9	16	–	80
Unloading equipment							
Cranes - 15 ton	3	–	–	–	–	12	15
Tracks - 120 ton	–	–	–	–	–	14	14
Stackers - 310 hp	–	–	–	–	–	8	8
Capital Required	$	$	$	$	$	$	$
Land	1,500,000	1,500,000	1,850,000	1,500,000	1,500,000	–	7,850,000
Stations	15,225,000	15,000,000	25,000,000	10,000,000	20,000,000	3,325,000	88,550,000
Barges	1,420,000	1,260,000	2,070,000	810,000	1,440,000	–	7,000,000
Unloading equipment	180,000	–	–	–	–	4,720,000	4,900,000
Total	18,325,000	17,760,000	28,920,000	12,310,000	22,940,000	8,045,000	108,300,000
Annual Cost							
Receiving, baling and loading							
Interest on land investment	90,000	90,000	111,000	90,000	90,000	–	471,000
Amortization of facilities	1,328,000	1,308,000	2,180,000	872,000	1,744,000	–	7,432,000
Labor	1,586,000	1,432,000	2,304,000	1,040,000	1,825,000	–	8,187,000
Maintenance, materials and supplies	330,000	300,000	500,000	200,000	400,000	–	1,730,000
Utilities	520,000	510,000	850,000	340,000	680,000	–	2,900,000
Subtotal	3,854,000	3,640,000	5,945,000	2,542,000	4,739,000	–	20,720,000
Transportation							
Amortization of barges	124,000	110,000	181,000	71,000	126,000	–	612,000
Maintenance of barges	67,000	52,000	86,000	34,000	50,000	–	299,000
Contract towing	915,000	554,000	860,000	343,000	687,000	–	3,359,000
Subtotal	1,106,000	716,000	1,127,000	448,000	873,000	–	4,270,000
Unloading and placing in landfill							
Amortization of facilities	–	–	–	–	–	290,000	290,000
Amortization of equipment	–	–	–	–	–	1,260,000	1,260,000
Labor	–	–	–	–	–	3,000,000	3,000,000
Maintenance, materials and supplies	–	–	–	–	–	950,000	950,000
Utilities	–	–	–	–	–	10,000	10,000
Subtotal	–	–	–	–	–	5,510,000	5,510,000
Total Annual Cost	4,960,000	4,356,000	7,072,000	2,990,000	5,612,000	5,510,000	30,500,000
Cost per Ton							
Receiving, baling and loading	4.12	3.89	3.81	4.07	3.80	–	3.91
Transportation	1.18	0.76	0.72	0.72	0.70	–	0.80
Unloading and placing in landfill	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Total	6.34	5.69	5.57	5.83	5.54	1.04	5.75

Table H-10

ESTIMATED COSTS FOR BARGE TRANSPORTATION OF CONTAINERIZED REFUSE

	Receiving, Containerizing, and Barge Loading Stations						
	North Shore	Medill	Central	Summit	Cal-Sag	Disposal Site	Total
Estimated Annual Quantity - tons	936,000	936,000	1,560,000	624,000	1,248,000	5,304,000	5,304,000
Property Required							
Station - tons/day avg	3,000	3,000	5,000	2,000	4,000	17,000	17,000
Containers	1,378	1,262	2,057	823	1,480	–	7,000
Barges	33*	28	41	18	33	–	153
Unloading equipment							
Cranes - 25 ton	–	–	–	–	–	11	11
Trucks - 120 ton	–	–	–	–	–	15	15
Capital Required	$	$	$	$	$	$	$
Land	1,500,000	1,500,000	1,850,000	1,500,000	1,500,000	–	7,850,000
Station	9,076,000	8,263,000	11,980,000	6,286,000	9,829,000	3,326,000	48,760,000
Containers	5,788,000	5,300,000	8,639,000	3,457,000	6,216,000	–	29,400,000
Barges	2,770,000	2,520,000	3,690,000	1,620,000	2,970,000	–	13,570,000
Unloading equipment	–	–	–	–	–	4,045,000	4,045,000
Total	19,134,000	17,583,000	26,159,000	12,863,000	20,515,000	7,371,000	103,625,000
Annual Cost							
Receiving, containerizing, loading							
Interest on land	90,000	90,000	111,000	90,000	90,000	–	471,000
Amortization of facilities	865,000	775,000	1,106,000	598,000	915,000	–	4,259,000
Labor	986,000	923,000	1,218,000	759,000	1,031,000	–	4,917,000
Maintenance and supplies	161,000	107,000	144,000	89,000	121,000	–	622,000
Utilities	110,000	110,000	149,000	98,000	122,000	–	589,000
Subtotal	2,212,000	2,005,000	2,728,000	1,634,000	2,279,000	–	10,858,000
Transportation							
Amortization of containers	1,374,000	1,258,000	2,051,000	821,000	1,476,000	–	6,980,000
Amortization of barges	242,000	220,000	322,000	141,000	259,000	–	1,184,000
Maintenance	440,000	369,000	584,000	240,000	433,000	–	2,066,000
Contract towing	1,460,000	1,142,000	1,622,000	649,000	1,298,000	–	6,171,000
Subtotal	3,516,000	2,989,000	4,579,000	1,851,000	3,466,000	–	16,401,000
Unloading, placing in landfill							
Amortization of facilities	–	–	–	–	–	310,000	310,000
Amortization of equipment	–	–	–	–	–	960,000	960,000
Labor	–	–	–	–	–	3,368,000	3,368,000
Maintenance and supplies	–	–	–	–	–	593,000	593,000
Utilities	–	–	–	–	–	10,000	10,000
Subtotal	–	–	–	–	–	5,241,000	5,241,000
Total Annual Cost	5,728,000	4,994,000	7,307,000	3,485,000	5,745,000	5,241,000	32,500,000
Cost Per Ton							
Receiving, containerizing and loading	2.36	2.14	1.75	2.62	1.83	–	2.05
Transportation	3.76	3.19	2.94	2.97	2.78	–	3.09
Unloading, placing in landfill	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Total	7.11	6.32	5.68	6.58	5.60	0.99	6.13

* Includes 5 small barges.

PIPELINE SLURRY TRANSPORT

The estimated cost of transporting 4,200,000 tons of solid wastes annually through a pipeline 53 miles long is summarized in Table H-11.

Table H-11

ESTIMATED COST FOR TRANSPORTING SOLID WASTE IN A SLURRY THROUGH A PIPELINE (4,200,000 tons annually)

	Capital Requirement	Annual Capital Cost	Annual Operating and Maintenance Cost	Total Annual Cost	Unit Cost
	$	$	$	$	$/ton
Receiving and processing	80,000,000	7,620,000	18,380,000	26,000,000	6.19
Pipeline and booster pumping	76,000,000	6,650,000	5,350,000	12,000,000	2.86
Separation of solids and wastewater treatment	54,000,000	4,700,000	4,300,000	9,000,000	2.14
Totals	210,000,000	18,970,000	28,030,000	47,000,000	11.19

TRANSFER VIA RAILROADS

A report prepared jointly by three Chicago area railroads on the feasibility and cost of rail transportation of solid waste from Cook County to the Ski Mountain site is presented in Appendix I. The railroad companies' estimates cover only rail transportation and do not include the cost of receiving, processing and loading solid wastes into rail cars, or the cost of unloading and delivering material to the landfill from the rail siding at the Ski Mountain site.

A second report, prepared by the Elgin, Joliet & Eastern Railway Company, also included in Appendix I, presents a plan and estimate of cost for receiving, processing, transporting by rail, and placing deep tunnel rock in the Ski Mountain. The cost of land for receiving, processing and loading facilities must be added to the railroad company estimates.

Table H-12 presents the estimated costs for receiving, processing, loading, transporting by rail, and delivering solid wastes to the fill area of the Ski Mountain based on the railroad companies' estimates of the rail transportation cost. The estimates are premised on ownership by the solid waste management agency of all facilities except the railroad companies' trackage on existing ROW, and upon the railroads operating and maintaining all rail transportation facilities, with the solid waste management agency operating and maintaining all other facilities.

Residential, Commercial and Industrial Refuse and Demolition Debris

Columns 1, 2 and 3 of Table H-12 show the estimated capital investment exclusive of railroad trackage on existing ROW, the annual capital and operating costs, and the average costs per ton for rail transportation to the Ski Mountain of baled, containerized, and shredded-separated-containerized residential, commercial and industrial refuse and combustible demolition debris. The costs, based on projected 1975 quantities, include receiving refuse at the twelve potential transfer stations indicated on Figure IV-3, processing, loading onto rail cars, transporting by rail, unloading from rail cars, and delivering to the final placement area.

Bales would be hauled on open cars but would be covered to prevent blowing and littering. Unbaled materials would be hauled in enclosed containers to achieve increased density and to provide sanitary and litter-free transportation, unloading, and conveyance to the final placement area. Baled refuse and containers would be unloaded from rail cars by crane and hauled to the placement area in large off-highway vehicles.

Incinerator Residue

Column 4 of Table H-12 shows the estimated capital investment exclusive of railroad trackage on existing ROW, the annual capital and operating costs, and the average cost per ton for rail transportation to the Ski Mountain of containerized incinerator residue. The costs are based on receiving residue at four of the twelve transfer stations proposed for residential, commercial, and industrial refuse, loading into containers on rail cars, transporting by rail in trains with other solid wastes, unloading from rail cars, and delivering to the final placement area. The estimates include 40 railroad cars, 200 containers, one crane, and one 100-ton off-highway truck for unloading and emptying containers at the Ski Mountain. The cost of delivering residue from incinerator plants to the transfer stations is not included.

Power Plant Ash

Column 5 of Table H-12 shows the estimated capital investment exclusive of railroad trackage on existing ROW, the annual capital and operating costs, and the average cost per ton for rail transportation to the Ski Mountain of power plant ash. The costs are based on providing three receiving stations to which power plant ash would be delivered and loaded into railroad cars by others. Ash would be hauled to the Ski Mountain in trains with other solid wastes where it would be dumped into large off-highway vehicles and conveyed to the final disposal area. The cost of delivering ash to transfer stations and loading onto rail cars is not included.

Rock

Column 6 of Table H-12 shows the estimated initial capital investment exclusive of railroad trackage on existing ROW, annual capital and operating costs, and average cost per ton for transportation by rail of Deep Tunnel rock to the Ski Mountain. The analysis was premised on providing three rail loading stations located near the three principal storm water storage facilities proposed for the Deep Tunnel system. The transporatation system would handle 20,000,000 tons of rock per year in essentially the manner described in the railroad company report, except that the rock would be sized to a maximum of 8 inches, delivered and loaded onto rail cars by others. The costs for these operations are not included.

Table H-12

ESTIMATED COST OF RAILROAD TRANSPORTATION OF SOLID WASTES

	Alternatives for Residential and Commercial and Residential Refuse and Combustible Demolition Debris					
	Baled Refuse	Containerized Refuse	Separated and Containerized Refuse	Incinerator Residue	Power Plant Ash	Deep Tunnel Rock
Estimated Annual Quantity - tons	6,266,000	6,266,000	6,266,000	440,000	500,000	20,000,000
Property Required						
Receiving stations	12	12	12	4	3	3
Containers	–	2,500	2,500	200	–	–
Railroad cars	475	560	560	40	40	650
Unloading facilities	1	1	1	1	1	1
	$	$	$	$	$	$
Capital Required						
Land	9,000,000	9,000,000	9,000,000	1,500,000	2,250,000	2,250,000
Receiving stations	97,193,000	45,371,000	118,371,000	909,000	682,000	1,506,000
Containers	–	17,500,000	17,500,000	1,400,000	–	–
Railroad cars	9,975,000	11,760,000	11,760,000	840,000	800,000	13,000,000
Other railroad equipment	3,512,000	3,512,000	3,512,000	250,000	550,000	8,157,000
Unloading facilities	2,330,000	2,330,000	2,330,000	170,000	165,000	6,825,000
Unloading equipment	2,855,000	890,000	890,000	205,000	135,000	5,452,000
Total	124,865,000	90,363,000	163,363,000	5,274,000	4,582,000	37,190,000
Annual Cost						
Receiving, processing and loading						
Interest on land	540,000	540,000	540,000	90,000	135,000	135,000
Amortization of facilities	8,474,000	4,081,000	10,435,000	95,000	60,000	205,000
Amortization of containers	–	4,155,000	4,155,000	332,000	–	–
Labor	8,695,000	4,112,000	14,750,000	195,000	–	1,330,000
Maintenance and supplies	2,269,000	1,351,000	4,193,000	20,000	4,000	548,000
Utilities	3,400,000	416,000	3,900,000	10,000	1,000	434,000
Subtotal	23,378,000	14,655,000	37,973,000	742,000	203,000	2,652,000
Transportation						
Amortization of railroad cars	870,000	1,025,000	1,025,000	73,000	70,000	1,767,000
Amortization of other railroad equipment	306,000	306,000	306,000	22,000	47,000	1,108,000
Contract hauling	7,519,000	7,519,000	7,519,000	528,000	580,000	12,600,000
Subtotal	8,695,000	8,850,000	8,850,000	623,000	697,000	15,475,000

Table H-12 (Continued)

ESTIMATED COST OF RAILROAD TRANSPORTATION OF SOLID WASTES

	Alternatives for Residential and Commercial and Residential Refuse and Combustible Demolition Debris					
	Baled Refuse	**Containerized Refuse**	**Separated and Containerized Refuse**	**Incinerator Residue**	**Power Plant Ash**	**Deep Tunnel Rock**
Unloading, placing in landfill						
Amortization of facilities	203,000	203,000	203,000	15,000	14,000	928,000
Amortization of equipment	678,000	212,000	212,000	37,000	12,000	740,000
Labor	1,480,000	1,050,000	1,050,000	48,000	35,000	1,014,000
Maintenance and supplies	425,000	310,000	310,000	35,000	55,000	1,597,000
Utilities	9,000	9,000	9,000	1,000	25,000	750,000
Subtotal	2,795,000	1,784,000	1,784,000	136,000	141,000	5,029,000
Total Annual Cost	34,868,000	25,289,000	48,607,000	1,501,000	1,041,000	23,156,000
Cost Per Ton						
Receiving, processing and loading	3.73	2.34	6.06	1.69	0.41	0.13
Transportation	1.39	1.41	1.41	1.41	1.39	0.78
Unloading, placing on landfill	0.45	0.29	0.29	0.31	0.28	0.25
Total	5.57	4.04	7.76	3.41	2.08	1.16

APPENDIX I

REPORTS BY RAILROAD COMPANIES ON FEASIBILITY AND COST OF RAIL TRANSPORTATION

CHICAGO AND NORTH WESTERN RAILWAY COMPANY
ILLINOIS CENTRAL RAILROAD
ELGIN, JOLIET AND EASTERN RAILWAY COMPANY

Chicago, Illinois

May 27, 1971

Mr. F.E. Kirkpatrick
Black & Veatch
1500 Meadow Lake Parkway
Kansas City, Missouri 64114

Dear Mr. Kirkpatrick:

The Chicago and North Western, Illinois Central, and Elgin, Joliet and Eastern Railways have completed their preliminary study regarding the transportation of refuse materials to be accumulated by the Chicago Sanitary District. We have based origin and destination sites on your recommendations with minor modifications.

Our study includes a detailed operating plan which we feel is realistic under the conditions that we have outlined for loading and unloading. Should conditions at origin and destination conflict with our assumptions, changes to our operating plan and projected rate would be in order.

This has been a most interesting project and we have devoted considerable effort to the development of the plan. Should you have questions concerning the report, we would be pleased to discuss it with you.

Yours very truly,

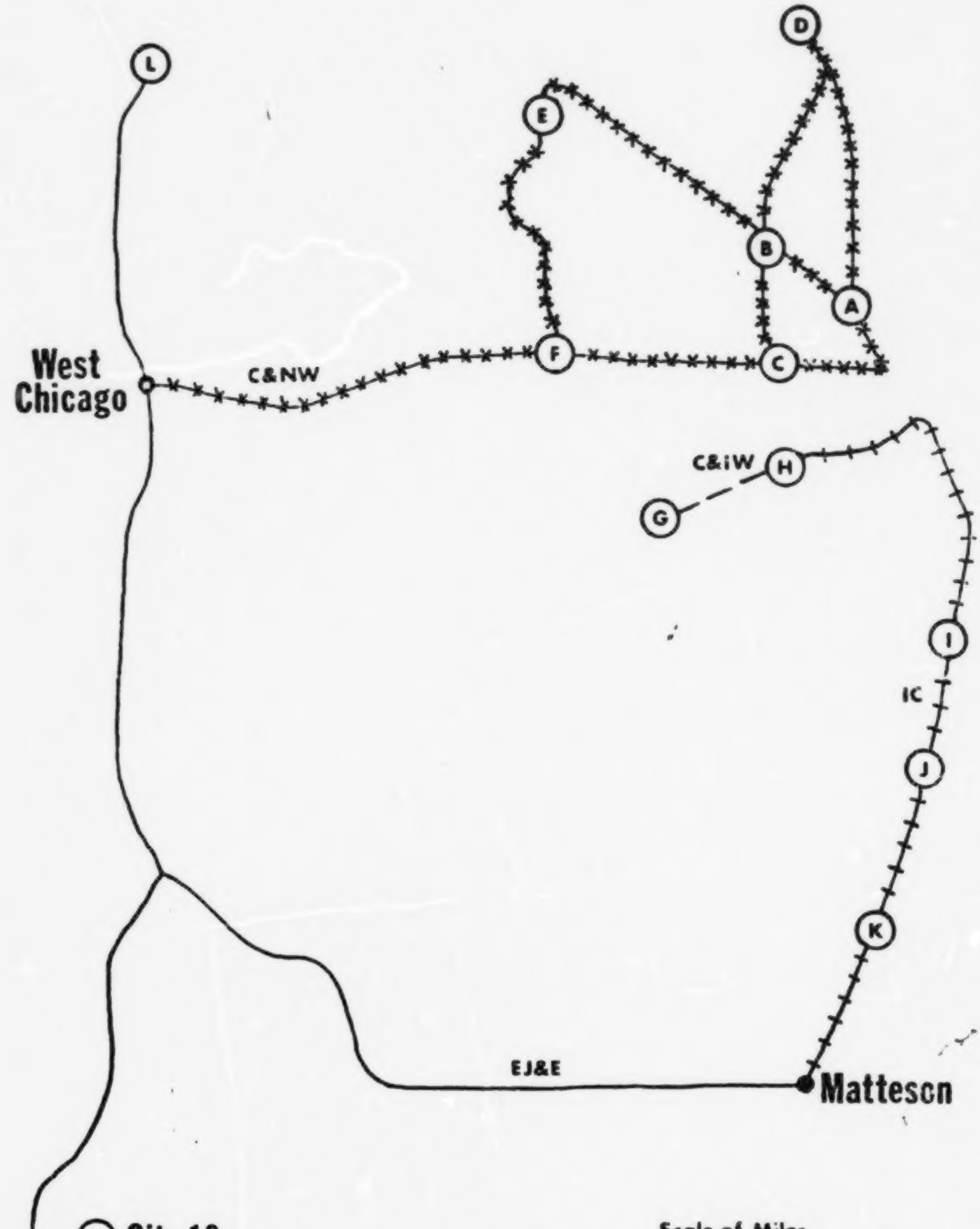
Chicago & North Western Railway　　Illinois Central RR　　EJ&E Railway Company

CHICAGO AND NORTH WESTERN RAILWAY COMPANY
ILLINOIS CENTRAL RAILROAD
ELGIN, JOLIET AND EASTERN RAILWAY COMPANY

WASTE DISPOSAL PROJECT

CHICAGO SANITARY DISTRICT

Chicago, Illinois
May 27, 1971


L
D
E
B
A
West Chicago
C&NW
F
C
C&IW
H
G
I
IC
J
K
EJ&E
Matteson
Site 10
Scale of Miles
1 0
5
10

C&NW, IC, EJ&E WASTE DISPOSAL PROJECT

Chicago & North Western, Illinois Central, and Elgin, Joliet and Eastern Railroads present the following rail handling plan and estimate of rail charges for Black and Veatch's use in their larger project to provide preliminary estimates of system requirements and costs for disposal of solid wastes from the built-up area of Cook County. Illinois Central speaks for its subsidiary Chicago and Illinois Western, who is also involved in the project.

GENERAL DESCRIPTION

System design is based on projected 1985 quantities of solid wastes by major category as follows:

	TONS PER YEAR
Residential refuse	2,500,000
Commercial refuse	1,300,000
Industrial refuse	2,500,000
Incinerator residue	450,000

Twelve tentative locations for loading stations were suggested by Black and Veatch to permit relatively short haul distances for refuse collection vehicles and so that each station could serve an area which would generate about 2,000 tons per day on a six day per week basis. The map on the opposing page displays: tentative loading locations, the three rail carriers, and the disposal site in Northeastern Grundy County referred to as Site No. 10.

In connection with the refuse disposal, the creation of a 1,000 foot mountain is being considered, using rock spoil from a deep tunnel project. The mountain would be designed for recreational use. Possible rail transport of the rock spoil is discussed in a separate report.

The refuse would be compacted into containers measuring 9 ft. wide, 11-1/2 ft. high, 20 ft. long, with a volumetric capacity of 60 yards. This is a slight change from the suggested 10 X 10-1/2 X 20 and was made to accommodate RR Plate B clearances for 65-ft. flat cars - 9 ft. width with ordinary truck spacing. A density of 650 pounds per cubic yard is anticipated, producing a 20 net ton load per container. Three containers would be transported on one 65-ft. flat car. Container tare would be approximately four tons each. Gross weight of three loaded containers and the flat car would be approximately 100 net tons.

Separate loading sites have been studied for incinerator residue, recognizing these plants are already at established locations. However, volumes, spread over four incinerator stations, do not promote special handling by rail. Savings associated with open-top conventional rail cars are dissipated by the slower turn-around of conventional handling and the need for separate unloading facilities. Therefore, we have considered the incinerator residue being handled in the same manner as the much larger volume of refuse - through the refuse loading stations. The container could carry at least 20 tons of incinerator residue.

Station volume is recapped below:

	ANNUAL TONS	6 DAY PER WEEK DAILY AVERAGE	
		TONS	65' CARLOADS
C&NW Origins:			
(A) Clybourn	624,000)		
& incinerator	100,000)	2,300	39
(B) Mayfair	624,000	2,000	34
(C) Chicago Shops, 40th St.	312,000)		
& incinerator	150,000)	1,500	25
(D) Wilmette	312,000	1,000	17
(E) Des Plaines	624,000	2,000	34
(F) Proviso	624,000	2,000	34
TOTAL	3,370,000	10,800	183
IC Origins:			
(G) McCook (CIW RR)	780,000	2,500	42
(H) Crawford (CIW RR)	312,000)		
& incinerator	100,000)	1,300	22
(I) Fordham	312,000)		
& incinerator	100,000)	1,300	22
(J) Wildwood	624,000	2,000	34
(K) Markham	780,000	2,500	42
TOTAL	3,008,000	9,600	162
EJ&E Origin: (L) I-90	312,000	1,000	17
GRAND TOTAL	6,690,000	21,400	362

112,944 Carloads Annually

The carriers have made only one suggested change regarding loading site locations. The area shown on Black and Veatch's map south of the Sanitary Canal near Brighton Park Yard (GM&O) should be relocated on the C&IW tracks near Crawford.

Refuse collection has been stated at a daily average rate based on a six day pickup. Proposed rail handling is on a six day per week basis with one day dead time at all loading sites and Site No. 10. This in itself can accommodate the daily average volumes. Seasonality and peaking can be expected, running 120 per cent peaks during summer months with 80 per cent lows during winter. By operating the seventh day, a peak of 116 per cent could be accommodated, assuming storage capacity at origin stations. We have provided for 8 per cent equipment spares and by holding the maintenance outage to 4 per cent during summer months and operating seven days, the peaks could be met. Our estimated price contemplates 337 days operation: 6 days per week year round, plus 25 additional days.

Average daily trailing tonnage to be handled is 36,200 - the schedules are devised to allow operation of four relatively equal sized trains. With four trains arriving and departing daily, operations at Site No. 10 will require 24 hour unloading of refuse so as to allow an even distribution of arrivals and departures (and refuse disposal) over each 24 hour period.

EJ&E would have to operate a terminal at Site No. 10, making locomotive and caboose servicing available. A switch crew would be necessary around the clock for train breakup and makeup.

EJ&E road crews would be called at Site No. 10 for turnaround service to West Chicago (interchange C&NW-EJ&E) and Matteson (interchange IC-EJ&E). C&NW-EJ&E would interchange once every twelve hours - say 0:00 and 12:00 - and IC-EJ&E would interchange once every twelve hours - say 6:00 and 18:00 - to facilitate an even arrival of loads at Site No. 10. Match at West Chicago and Matteson, with return loads in the case of EJ&E, and return empties in the case of C&NW and IC, has been contemplated and is a critical part of the economics of the rail schedules. Interchange would amount to the engine and train crews trading a loaded train with run-through power and caboose for an empty train with run-through power and caboose.

C&NW would run two collection trains daily from Proviso: one picking up at (A) Clybourn, (B) Mayfair, and (C) 40th Street; and the oth at (D) Wilmette, (E) Des Plaines, and (F) Proviso. Two road trains would run daily from Proviso to West Chicago interchange and return. C&NW would also run two empty distribution trains daily from Proviso setting out in the reverse order of pickup.

C&IW RR would run a crew daily from Crawford Yard to pick up at (G) McCook, and (H) Crawford, and interchange with IC at Crawford. IC would run a yard crew from Markham to pick up these loads at the C&IW interchange and fill out at (I) Fordham - the crew would tie up at Markham Yard. A road crew would take the loads to interchange with EJ&E at Matteson and return to Markham Yard with empties. A yard crew from Markham would deliver these empties to (I) Fordham and interchange with C&IW RR at Crawford. A C&IW crew would deliver empties to (H) Crawford and (G) McCook. IC would also run a road crew from Markham Yard, picking up at (J) Wildwood and (K) Markham, delivering to EJ&E at Matteson and returning with empties for set-off at (K) Markham and (J) Wildwood before tying up at Markham Yard. The EJ&E site (L) I-90 would be serviced six days per week with existing crews.

Crew schematics are shown as Exhibits A and B. These schedules allow a minimum of 7 - 8 hours to unload at Site No. 10 and eight hours at each of the loading sites. Car set schematics are shown as Exhibits C and D. The times at the loading sites vary substantially in terms of hour of the day. Loading would have to be accomplished within the time the empties were there regardless if it were 3:00 a.m. to 11:00 a.m. or some other unusual shift. The loading time is the same at each individual station each day, within the reliability of the schedule.

ROLLING STOCK REQUIREMENTS

Cars and Containers:

Service to C&NW origins would require three car sets. The same is true of service to IC origins. Each set turns every 1-1/2 days. Two car sets would be required to service the EJ&E I-90 site. Total flat car and container requirements are developed as follows:

C&NW (A) 39, (B) 34, (C) 25 = 98 flats per day X 1.5 day turn = 147
(D) 17, (E) 34, (F) 34 = 85 flats per day X 1.5 day turn = 128

(Cont'd.)

IC	(G) 42, (H) 22, (I) 22	= 86 flats per day X 1.5 day turn =	129
	(J) 34, (K) 42	= 76 flats per day X 1.5 day turn =	114
EJ&E	(L) 17	= 17 flats per day X 2.0 day turn =	34
			552
		8% spares	48
		Total Flat Car Requirements	600
		Total Container Requirements	1800

Locomotives and Cabooses:

C&IW would utilize existing locomotives. C&NW, IC, and EJ&E would require two 2000 HP diesels to handle the train sizes outlined above. Locomotive set turnaround on C&NW-EJ&E is every 36 hours, with 8 hours service time at Site No. 10. Turnaround on IC-EJ&E is every 24 hours (because C&IW service is separate) with 6 - 8 hours service time at Site No. 10. See schematic - Exhibit E. Ten road locomotives are required for constant service and an outage of 1 has been contemplated. A 1000 HP switcher would be necessary at Site No. 10. Road cabooses follow locomotive sets plus one spare.

Requirements: 11 - 2000 HP road diesels
1 - 1000 HP yard diesel
6 - road cabooses
1 - yard caboose

TRACKS AND PERMANENT FACILITIES

Track construction at origins for railroad purposes could theoretically be limited to a single track long enough to hold the daily number of loads at that station. This is possible because one crew is picking up loads and another crew, later in the day, is delivering empties. However, if empties were ordered in and not loaded they would have to be pulled out empty and run to Site No. 10 - the next day's empty supply is already on its way and there would be no place to put it. Breaking the trains at Proviso and Markham to add or delete cars is not desirable nor provided for. We therefore conclude that each origin would need track capacity for two days loading. This allows unused empties to be left behind and gives time to adjust empty orders so as to work off the overage.

There will always be a minimum of two car sets physically on hand at one time at Site 10, plus the 48 spares and other excess empties during low periods (train arrivals and departures every six hours versus unloading on a 7 - 8 hour cycle). At a minimum, a five track yard is necessary (each track 6500 ft. in length): three tracks for cars on hand, one track to use as a run-around, and one track to protect possible arrival of a loaded train before departure of an empty train. These tracks are for arrival, departure, and train makeup purposes. Tracks necessary for unloading would be in addition.

Diesel fueling and inspection facilities and caboose servicing tracks would be necessary. Protective buildings and sanitary facilities for crew members, car inspectors, and supervisors would be required.

RAIL RATES

Our study indicates that rail rates of $1.20 net ton are feasible including:

1. Crew expense;
2. Locomotive repair and maintenance, exclusive of ownership costs and facilities at Site 10;
3. Car repair and maintenance, exclusive of ownership costs;
4. Track repair and maintenance, exclusive of ownership of origin and destination trackage;
5. Upgrading of EJ&E's Illinois River Line;
6. Contingencies, overhead and rail profit.

The figure contemplates six day per week crew schedules as outlined, and 25 days of seventh day operation. The carriers would need a minimum charge per day, regardless of cars handled, to protect the schedule. This is an overall average pricing approach for the entire job as defined to us. The manner of collecting these charges is not yet clear. There could be separate charges from various origin groups reflecting the particular cost characteristics of servicing that area. This would protect against high volumes developing at high cost origins and low volumes at low cost areas to the detriment of an overall average price. It would also facilitate the rate treatment of new origin stations on a cost oriented basis.

We have specifically excluded certain ownership costs from the above figure for practical reasons. The carriers cannot forecast their ability to borrow capital in the 1980's, nor interest rates and depreciation laws that would apply. All of these have a bearing on conversion of the capital costs to a cents per ton figure. It could well be that the agency would have more advantageous circumstances than the carriers, which would mean that they should own the equipment. If you assume an 8 per cent cost of borrowing and a ten year amortization period, conversion of the capital cost to $.44 net ton is possible as outlined on Exhibit F (Summary of Capital Cost).

This would bring the cost to a total of $1.64 net ton still exclusive of container ownership and repair and maintenance. The methods chosen to compact the refuse in the containers and to disgorge the contents will greatly influence their original cost and the maintenance necessary. At the present time the carriers do not have insight into these loading and unloading matters and cannot make a reasonable estimate of costs in this area. As a point of design, however, we suggest a wedge-shaped bottom which would secure itself into a deep well in the floor of the car. This would provide a simple method of holding the containers on the rail cars without latching or locking devices which would require activation and maintenance.

We are pleased to be able to work with you in the development of this project and stand ready to furnish additional data and firm quotes as the development of the project merits.

These figures are at 1970 wage and price levels and would have to be reviewed and up-dated at the time of decision to handle via rail.

EXHIBIT I

SUMMARY OF CAPITAL COST

ROLLING STOCK:

1800 Containers	Not estimated
600 Flat cars, standard UF, 77-ton capacity, @ $21,000	$12,600,000
11 Road diesels SD-38 AC, 2000 HP, ballasted to 390,000 lbs., radio and train control equipped @ $307,000	3,377,000
1 Yard diesel, 1000 HP, radio equipped	175,000
7 Cabooses, radio equipped @ $30,000	210,000
TOTAL (Excluding containers)	$16,362,000

TRACKS AT ORIGINS:

	NUMBER OF CARS/DAY	X 2 Days X 70' Per Car
(A)	39	5,460 feet
(B)	34	4,760 "
(C)	25	3,500 "
(D)	17	2,380 "
(E)	34	4,760 "
(F)	34	4,760 "
(G)	42	5,880 "
(H)	22	3,080 "
(I)	22	3,080 "
(J)	34	4,760 "
(K)	42	5,880 "
(L)	17	2,380 "

Total linear feet of 115# new rail 50,680 @ $20/ft. =	$ 1,014,000	
Add 12 turnouts from main line @ $6,000	72,000	
Add 12 turnouts for second track @ $6,000	72,000	
Add estimated 500 ft. lead @ station @ $20/ft.	120,000	
TOTAL TRACK AT ORIGINS	$1,278,000	(1)
Yard tracks at Site #10, locomotive and caboose servicing facilities, buildings, sanitary facilities, parking, etc.	2,288,000	
GRAND TOTAL CAPITAL	$19,928,000	
Add interest cost estimated at 8 per cent simple for ten year term, payments quarterly	9,210,000	
TOTAL	$29,138,000	
Divided by 66,000,000 tons available in a ten year period	$ .44 per ton	

(1) All track costs are exclusive of sub-grade. It is assured that each site will have close-by fill because of foundation work or other site preparations.

TRANSPORTATION OF WASTE ROCK FROM DEEP TUNNEL DRAINAGE SYSTEM

CHICAGO SANITARY DISTRICT

ELGIN, JOLIET & EASTERN RAILWAY CO.
Chicago, Illinois
May 27, 1971

TRANSPORTATION OF WASTE ROCK FROM DEEP TUNNEL DRAINAGE SYSTEM

CHICAGO SANITARY DISTRICT

During periods of high precipitation, storm water runoff infiltrates Chicago's sanitary sewer collection system to such an extent that the combined sewerage exceeds the capability of the treatment facility. The Metropolitan Sanitary District of Greater Chicago has proposed to eliminate this condition through creation of underground reservoirs to store the excess flows for subsequent treatment during periods of low flow. Creation of the "Deep Tunnel Drainage System," as it is called, will require the removal of 200 million tons of rock from three excavation sites in Chicago over a ten year construction period. The disposal of this amount of waste rock in or around Chicago presents still another problem to the Sanitary District. One proposed solution is to utilize the material to construct a ski-hill on a site about twelve miles southwest of Joliet (called Disposal Site 10).

Elgin, Joliet and Eastern Railway Company serves the proposed site for construction of the ski-hill and also connects with all rail lines entering the City of Chicago. For these reasons it is in position to pursue transportation of this product via rail from the three proposed excavation sites even though the precise location of these sites is not determined and the particular railroads with whom EJ&E would be working are not known.

Our studies have been based on the following annual figures for a ten year period:

Excavation Site	Net Tons per Year
Northside	4,000,000
Southwest	14,000,000
Calumet	2,000,000
TOTAL	20,000,000

No information was available as to the mining techniques to be utilized or the type and size consist of the material to be produced. Our principal concern here in developing a transportation system is the size of the product as it might be tendered to the railroads and the methods that would be available to load and unload such material. EJ&E engaged a consulting engineering firm whose principal activity involves large scale mining and transportation methods. For purposes of their feasibility study, it was assumed that the material excavated would be run-of-mine dolomitic limestone, having a weight of approximately 100 lbs. per cubic foot upon delivery to the railroads. To represent the worst possible condition for the railroads, the study was based on the premise that the rock would be loaded after blasting by trackless mining equipment for haulage to a shaft or skipway where it would be hoisted to the surface and dumped into a pocket or bin in the head frame for subsequent disposal. Considering methods available for loading, unloading, and distribution on the mountain of an unsized material versus a sized material, our consulting engineer has recommended crushing at origin.

A flow sheet showing the material preparation and loading scheme is shown on Exhibit I. A general description of the material handling concept is carried on Exhibit II.

CRUSHING AND RAIL LOADING COSTS

Capital costs of the crushing plants at the three sites, including surge, stockpile, and reclaim facilities, loadout facilities including tracks and roads, fencing, repair and maintenance facilities, etc., total $10,931,000, as detailed on Exhibit III. Annual operating costs for crushing and loading operations have been estimated at $2,311,400 or approximately 12 cents a ton. Details are shown on Exhibit IV.

RAIL UNLOADING AND FINAL PLACEMENT COSTS

Capital costs of unloading and placement facilities at Disposal Site 10, including rotary dumper, rail terminal and yards, overland conveyor, mobile stacker and spreader equipment total $12,277,000, as detailed on Exhibit V. Annual operating costs of unloading and placement operations are estimated at $3,360,500 or approximately 17 cents per ton. Details of these costs are shown on Exhibit VI.

RAIL HAUL COSTS

Assuming a 360 day work year, but only 92.5 per cent operating time, the following tonnages would be available on a daily basis:

EXCAVATION SITE	TONS PER YEAR	TONS PER DAY
Northside	4,000,000	12,000
Southwest	14,000,000	42,000
Calumet	2,000,000	6,000
Total	20,000,000	60,000

Five 120 car trains will be required each day to transport the waste rock in 100-ton cars to the disposal site. The schedule would call for one train per day from the Northside site, three and four trains per day from the Southwest site on alternate days, and one from Calumet every other day.

A 100-ton car with swivel couplings appears to be the most economical type for this service - winning out over the side dump (with or without air cylinders for self-dumping) and the bottom dump because of overall impact on the cost of rolling stock plus unloading facilities. A car measuring about 32 ft. coupler to coupler and having approximate inside dimensions of 28' X 9-1/4' X 7' should weigh about 28 tons for this service and could readily carry 100 tons of waste rock at its assumed loose weight of 100 lbs. per cubic foot.

Assuming a 1 per cent ruling grade against the loads on any of the routes chosen, four 2000 HP diesel electric locomotives would be required to handle each of the 120 car trains.

The loading sites are capable of 4000 tons per hour and the locomotives would stay on the train during loading operations. Considering a runaround for the locomotive and caboose at origin, the work should be accomplished in approximately four hours. The longest distance from any of the loading sites to the disposal sites is approximately seventy miles and five hours running time in either direction would appear adequate. At the disposal site switch crews would feed 40 car cuts of loads to the Barney for positioning in the rotary dumper, which has an operating rate of 4000 tons per hour and should handle a trainload in under four hours. Considering traffic delays and contingencies then, it is very realistic to expect a 24 hour cycle for each train. Therefore, five car sets of 120 cars would be needed and allowing for 8 per cent outage, an investment in 650 cars would be required. Considering switching service at the disposal site and maintenance outage, 26 locomotives would be required. Five road cabooses would also be needed. Capital requirements for rail haul are summarized below:

650 cars	@	$ 20,000 each	=	$13,000,000
26 locomotives	@	307,000 each	=	7,982,000
5 road cabooses	@	35,000 each	=	175,000
	Total			$21,157,000

We estimate that operating costs for the schedule outlined above, including locomotive and car repair and maintenance, crews, agency, maintenance of roadway, plus overhead, contingencies and rail profit, would make possible rail rates of approximately 63 cents net ton, exclusive of depreciation.

SUMMARY

Total capital requirements for the entire project, including crushing, loading, rail haul, unloading and placement, are recapped below:

	Capital	Interest Expense*	Total
Crush and load	$10,931,000	-	-
Rail haul	21,157,000	-	-
Unload and place	12,277,000		
Total	$44,365,000	$20,503,000	$64,868,000

*Assumes 8 per cent simple interest payable quarterly over 10 years.

If this cost were spread out over the 200,000,000 tons indicated for the project life, the grand total capital costs might be viewed in the area of 33 cents net ton, depending on prevailing interest rates and the ability of the borrower to secure the loan.

Summarizing further then:

Operating costs for crushing and loading	- $ .12 net ton
Operating costs for rail haul	- .63 net ton
Operating costs for unloading and placement	- .17 net ton
Capital and interest	- .33 net ton
Grand Total	- $1.25 net ton

We have not been able to project the detail with regards to the haulage of waste rock that we were able to build into our preceeding study concerning the haulage of refuse simply because the origin railroads are not clear at this time. We would point out that certain improvements necessary on the EJ&E in order to accommodate the refuse movement are prerequisite to the movement of waste rock, and if for any reason the rock should be considered without the refuse, the figures indicated in this report would have to be revised upward by some small amount. Also, our figures in this study do not recognize the cost of land acquisition.

All estimates are based on current wage and price levels and, of course, these would have to be up-graded at the time the project was to take form.

T.J. Siegel

EXHIBIT II

GENERAL DESCRIPTION OF MATERIAL HANDLING CONCEPT

The rock would be loaded, after blasting, by trackless mining equipment for haulage to a shaft or skipway where it would be hoisted to the surface and dumped into a pocket or bin in the headframe for subsequent disposal.

In the design depicted by the schematic flowsheet, the run-of-mine rock in the bin would be fed by a pan feeder to a vibrating grizzly where the plus 8-inch material would be scalped off for primary crushing. The product from grizzly and crusher would then be pan-fed to a vibrating screen from which the through product would drop to the out-haul belt and the oversize discharged to the secondary crusher for a further reduction in top-size before joining the by-passed material on the out-haul belt.

The minus 4-inch material, possibly with some tramp oversize, would then be conveyed to the surge pile for accumulation in live storage between railcar loading operations. Withdrawal from stockpile would be by underground draw points with pans feeding the out-haul belt to the 500 ton pocket at a rate commensurate with that required for the optimum car loading schedule.

Rail haul of the material to the disposal site would be in 100 ton cars, equipped with swivel couplings for roll-over dumping, made up into 120 car trains powered by four 2000 HP diesel locomotives.

At the disposal site, the train would be broken into forty car cuts for feed to a rotary dumper equipped with a positioner, or "Barney," for accurate spotting of the cars. After the cars had been dumped into a bin, the material would be pan-fed to an out-haul belt for transfer to the "overland" conveyor which, in turn, would discharge onto the rail-mounted trailing conveyor of the stacker.

The rotating, luffing boom stacker, mounted on either rail trucks or crawlers, would then either deposit the material in its final position or would transfer it to rubber-mounted, high-speed scrapers for controlled placement. The scrapers could also be used for loading, hauling, placing and compacting a suitable top dressing for the ski-hill from local borrow pits.

EXHIBIT III

APPROXIMATION OF CAPITAL COSTS FOR CRUSHING AND RAIL LOADING

	Thousands of Dollars		
	Northside	Southwest	Caluret
1.0 Excavation Sites			
1.1 Crushing Plants*			
Building:			
Site Preparation	$ 18	$ 32	$ 18
Piling & Concrete	92	200	92
Structure	340	495	340
Heating & Ventilating	30	50	30
Total	480	777	480
Equipment Installed:			
Feeders	100	300	100
Crushers	150	440	150
Screens	75	200	75
Cranes & Hoists	80	125	80
Total	405	1,065	405
Electrical	115	270	115
Total Crushing Plants	1,000	2,112	1,000
1.2 Stockpile & Reclaim Facilities**			
Stockpile Conveyors	125	175	125
Reclaim Tunnels & Gates	300	300	300
Reclaim Conveyors	250	250	250
Electrical	100	110	100
Total	775	835	775
1.3 Load-out Facilities			
Load-out Pocket (Complete)	250	250	250
Yard & Pocket Tracks	345	500	345 ✓
Total	595	750	595
1.4 Miscellaneous Facilities & Equip.			
Roads, Fence & Area Lighting	37	90	37 ✓
Repair & Maint. Facilities	155	390	155
Front End Loader & Service Vehicles	100	250	100
Utilities	15	40	15
Total	307	770	307
Total Excavation Sites	$2,677	$4,467	$2,677
Total Excavation Sites			$9,821
Engineering (6%)			589
Contingencies (5%) of Sub-Total			521
Grand Total Investment Excavation Sites			$10,931

NOTE:

			Northside	Southwest	Caluret
* 1.1	Crushing Plants:	No. of Shifts	3	3	2
		Tons per hour	600	2,100	500
** 1.2	Reclaim Rate:	Tons per hour	4,000	4,000	4,000

EXHIBIT IV

APPROXIMATION OF ANNUAL OPERATING COST FOR CRUSHING AND RAIL LOADING

Item	Annual Cost
1.0 Material Preparation & Loading	
1.1 Northside Site	
1.1.1 Labor:	
Crushing & Stockpiling:	
5 men/shift, 3 shifts/day = 15 men	
Load-Out:	
1 man/shift, 1 shift/day = 1 man	
Total	
16 men @ $14,000 =	$ 224,000
Add Swing Shifts @ 40%	89,600
1.1.2 Power:	
7,494,000 KWH @ $0.015/KWH	112,410
1.1.3 Repair & Maintenance:	
2% of Structures ($640,000)	12,800
5% of Mechanical ($1,400,000)	70,000
1.1.4 Fuels, Lubricants, & Supplies	30,000
Total Item 1.1	$ 538,810
1.2 Southwest Site	
1.2.1 Labor:	
Crushing & Stockpiling:	
10 men/shift, 3 shifts/day = 30 men	
Load-Out:	
2 men/shift, 3 shifts/day = 6 men	
Total	
36 men @ $14,000 =	$ 504,000
Add Swing Shifts @ 40%	201,600
1.2.2 Power:	
16,656,000 KWH @ $0.015/KWH	249,840
1.2.3 Repair & Maintenance:	
2% of Structures ($795,000)	15,900
5% of Mechanical ($2,345,000)	117,250
1.2.4 Fuels, Lubricants, & Supplies	85,000
Total Item 1.2	$1,173,590
1.3 Calumet Site	
1.3.1 Labor:	
Crushing & Stockpiling:	
3 men/shift, 2 shifts/day = 6 men	
Load-Out:	
2 men/shift, 1/2 shift/day = 1 man	
Total	
7 men @ $14,000	$ 98,000
Add Swing Shifts @ 40%	39,200
1.3.2 Power:	
4,746,000 KWH @ $0.015/KWH	$ 71,200
1.3.3 Repair & Maintenance:	
2% of Structures ($640,000)	12,800
5% of Mechanical ($1,400,000)	70,000
1.3.4 Fuels, Lubricants, Supplies & Misc.	25,000
Total Item 1.3	$ 316,200
Total Item 1.0 Direct	$2,028,600
1.4 Supervision	
15% of Labor ($1,156,400)	173,500
1.5 State & Local Taxes	
1% of Investment ($10,931,000)	109,300
Total Annual Operating Cost	$2,311,400
Cost per Ton (÷ 20,000,000)	12¢ N.T.

EXHIBIT V

APPROXIMATION OF CAPITAL COSTS FOR RAIL TERMINAL, UNLOADING, AND FINAL PLACEMENT FACILITIES

	Thousands of Dollars
Rail Terminal & Yards	$ 2,500
Unloading Facilities	
Yard and Dump Tracks	$ 500
Rotary Dumper (Complete)	1,750
Overland Conveyor	3,150
Mobile Stacker	500
Spreading Equipment	1,100
Repair and Maintenance Facilities	250
Service Vehicles and Other Equipment	150
Electrical and Floodlighting	1,130
TOTAL	$ 8,530
Total Disposal Site	$ 11,030
Engineering (6%)	662
Contingencies (5%) of Sub Total	585
Grand Total Investment Disposal Site	$ 12,277

EXHIBIT VI

APPROXIMATION OF ANNUAL OPERATING COST
UNLOADING AND PLACEMENT

	Item	Annual Cost
1.0	Unloading and Placement	
1.1	Labor	
	Rotary Dumper: 3 men/shift	
	Conveyors and Stacker: 3 men/shift	
	Spreading Equipment: 9 men/shift	
	Total: 15 men/shift, 3 shifts/day	
	45 men @ $14,000	$ 630,000
	Add Swing Shifts @ 40%	252,000
1.2	Power	
	49,950,000 KWH @ $0.015 KWH	749,250
1.3	Repair and Maintenance	
	2% of Structures ($750,000)	15,000
	5% of Mechanical plus Belt Replacement	666,500
1.4	Fuels, Lubricants, Supplies and Misc.	
	4 Tractors @ $10.00/hr. = $40.00/hr.	
	4 Scrapers @ $16.00/hr. = $64.00/hr.	
	$104.00/hr. X 6660 hrs/yr.	$ 692,650
	Miscellaneous	100,000
	Total Direct	$3,105,400
1.5	Supervision	
	15% of Labor ($882,000)	132,300
1.6	State and Local Taxes	
	1% of Investment ($12,277,000)	122,800
	Total Annual Operating Cost	$3,360,500
	Cost per Ton (÷ 20,000,000)	17¢ N.T.

µσ653